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CIO

THE MAGAZINE FOR INFORMATION EXECUTI

SEPTEMBER 1, 1998

SECTION ONE
150 PAGES IN TWO SECTIONS

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Ken Cohn was fast off the mark when Potomac Electric Power had to respond to a dicey situation

Quick Response

Information Strategies For Managing A Crisis

PAGE 34

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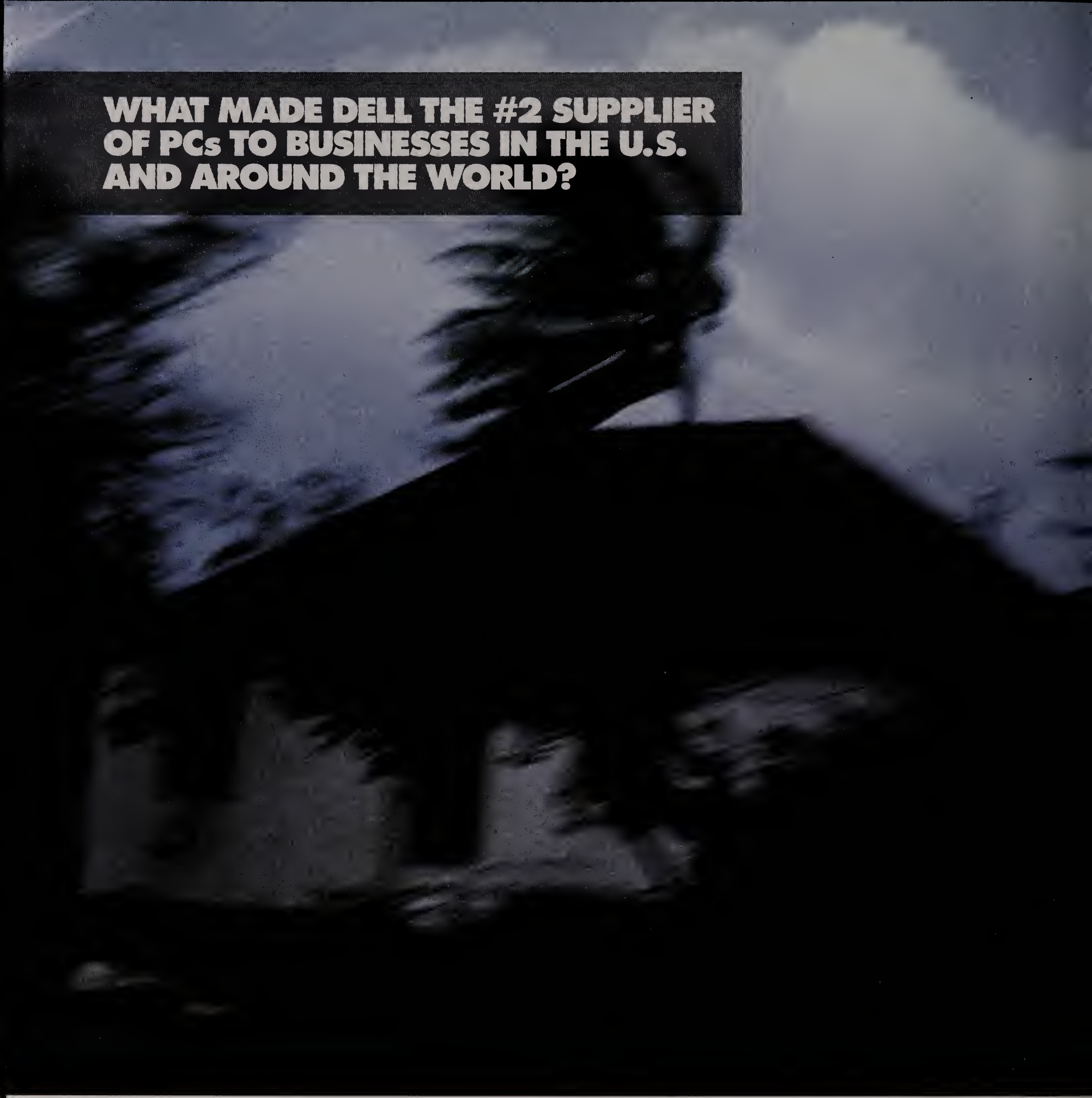
World-Class Global Teams

PAGE 42

How The Air Force Made Its Enterprise Architecture Fly

PAGE 52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CIO

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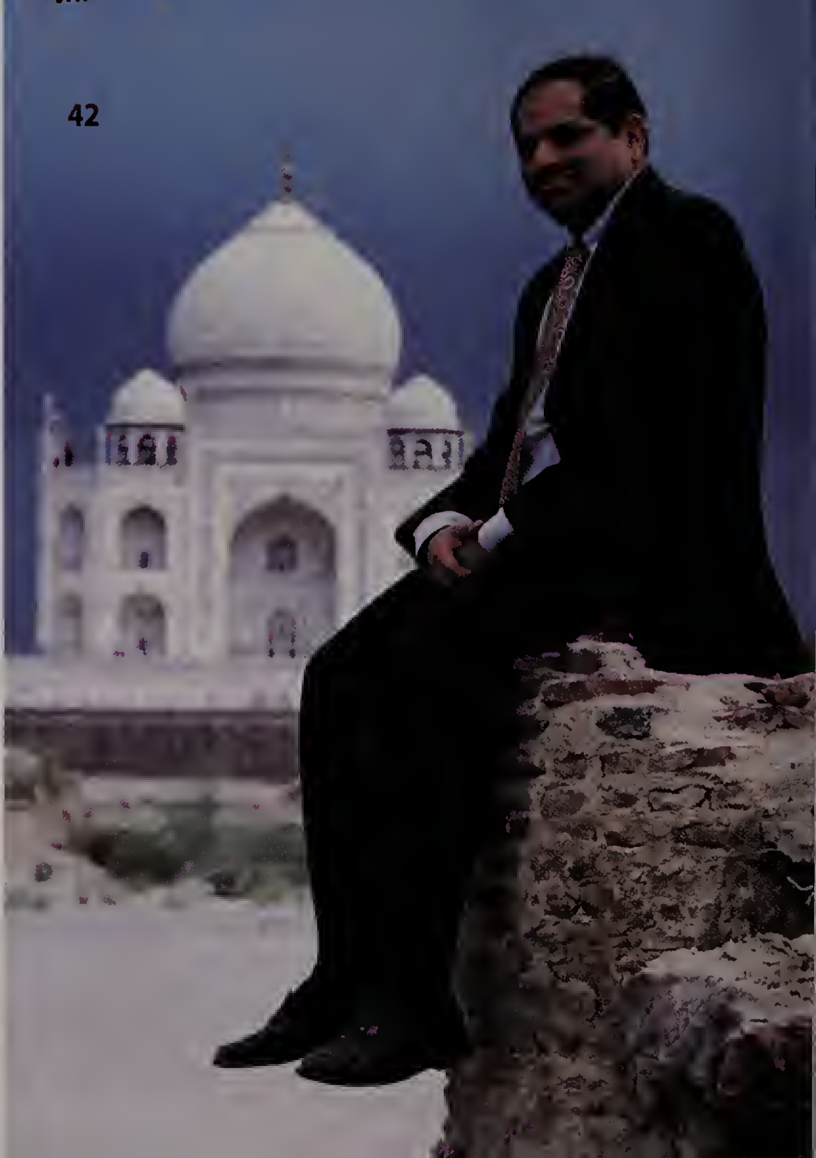

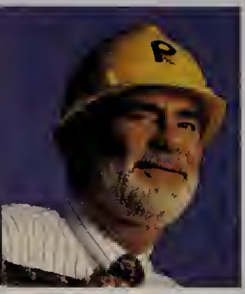

ON THE COVER

Ken Cohn, general manager of computer services for Potomac Electric, has learned the importance of reacting swiftly in the face of crisis.

Cover photo by Katherine Lambert

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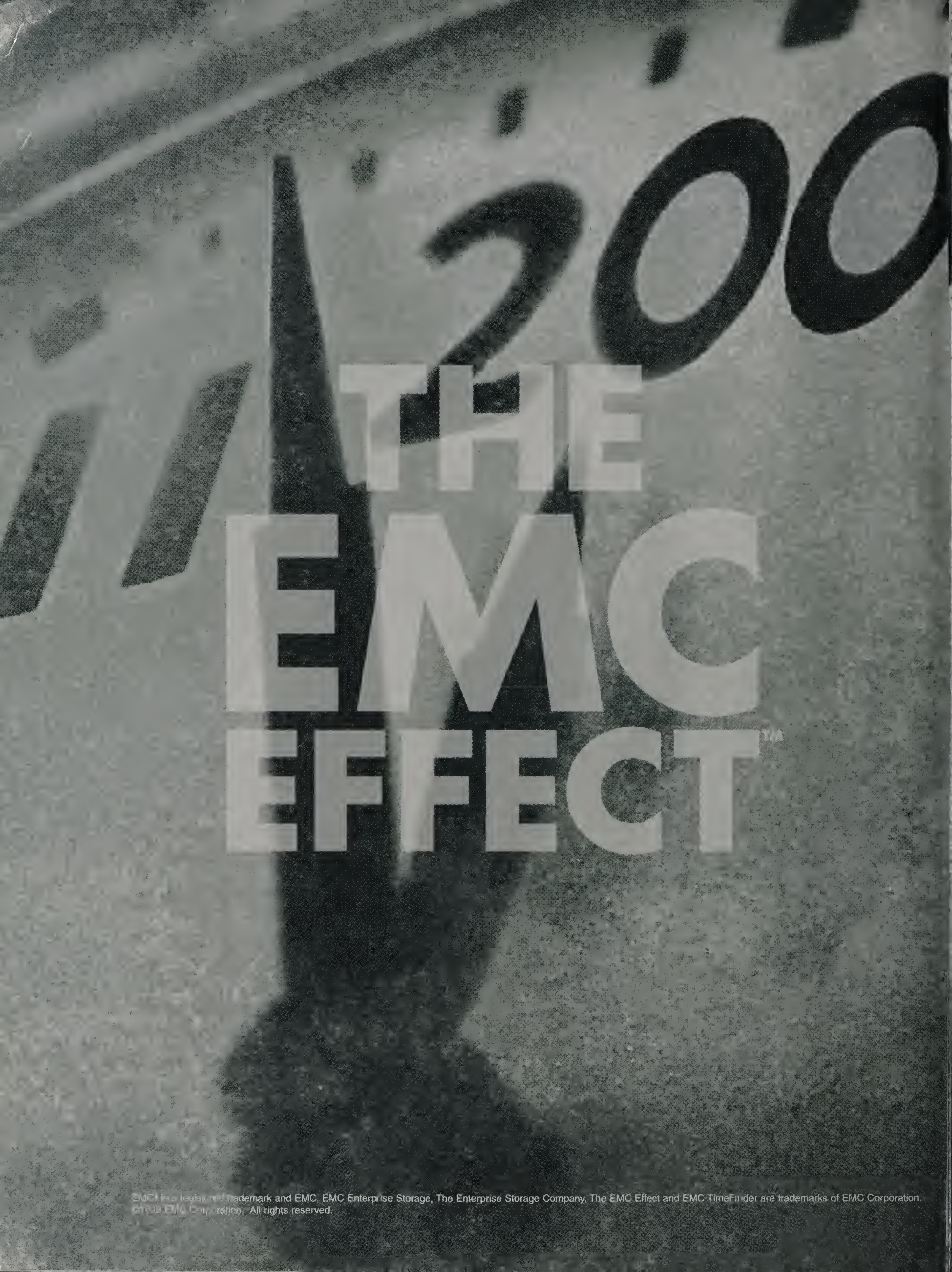

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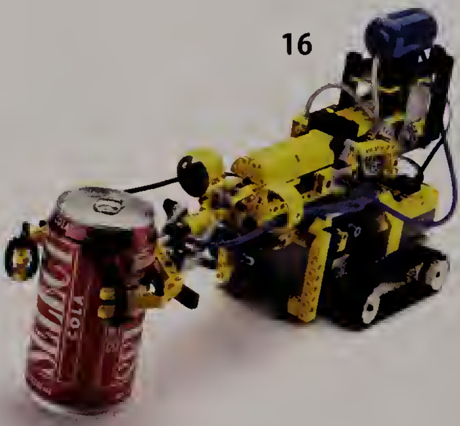

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CIO WebBusiness
Cool School
Can an online university, funded by state governments and high-tech companies, change the face of education?

Inside Section 2

COVER STORY: VIRTUAL EDUCATION State governments and corporate donations fuel a controversial effort to broker online courses.

CUSTOMER SERVICE How well do companies serve their customers online?

INTRANET PROFILE At Booz, Allen, a model of knowledge management makes expertise easy and a few experts uneasy.

NETREPRENEURS A Web-based service makes it easy for companies to give investors everything they need to know.

GRAY MATTERS If the content on someone else's Web site looks so good you'd like to make it your own, read this first.

THE MAIN ATTRACTION Five secret ingredients for turning uncommitted surfers into paying customers.

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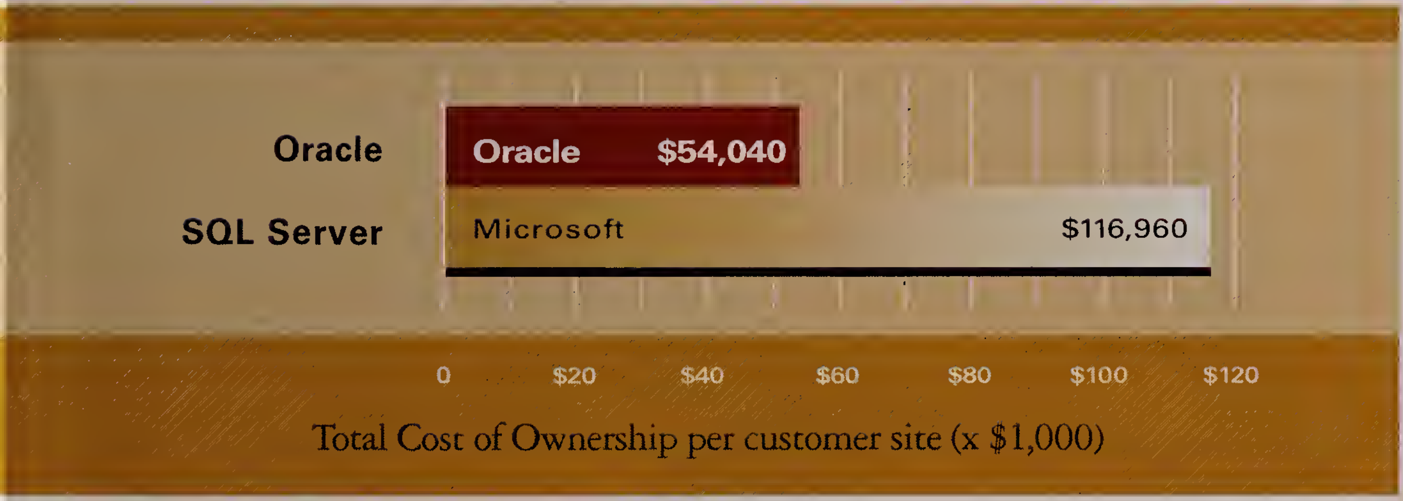

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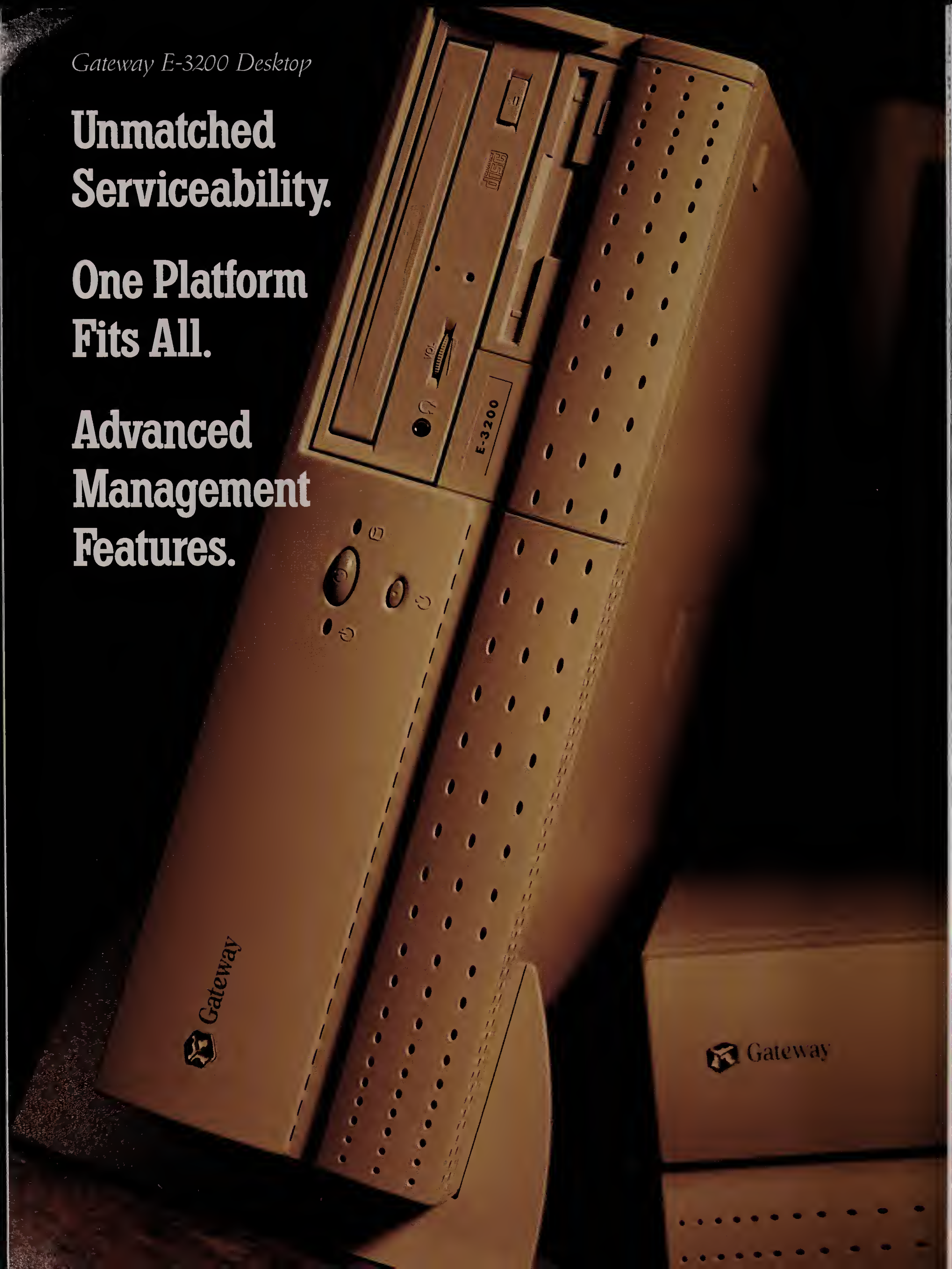

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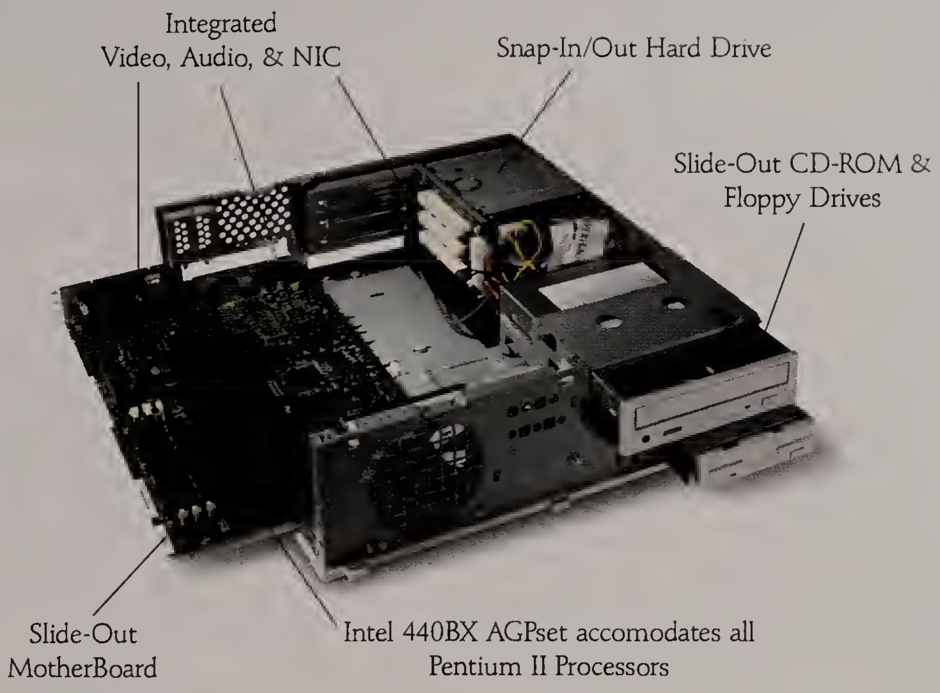
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In Box

LETTER FROM THE EDITOR, READER FEEDBACK AND HOW TO REACH US

Creativity is back in vogue, and I'm delighted. Tom Peters makes it the focus of his most recent book, *The Circle of Innovation*, and spoke about it at the CIO Perspectives conference in April. Harvard Business School professor Michael E. Porter addressed the National Innovation Summit held at MIT in March. Rosabeth Moss Kanter, global-business guru and professor at the Harvard Business School, made creativity and innovation central to a speech she delivered at the CSC Exchange in Boston in July.

PHOTO BY WEBB CHAPPELL

At *CIO*, we've always felt driven to improve on what we've done before. But as Peters says in his CIO Manifesto (see Page 26), "We do not want to be the best of the best, we want to be the only ones who do what we do." That's hard even in stable times. Today, when competitors are springing up in the most unlikely places and customers have all the choices in the world, it's a bear.

Kanter ties the need for creativity to the threat of what she calls "bypass," which comes "not from head-to-head competition but from small niche companies offering customers something different." Kanter and Peters urge businesspeople to look to the fringe for new competition and ideas.

To thrive in a changing global economy, companies need what Kanter calls the three C's: concepts (new ideas), competence (high skill levels and the ability to deliver) and connections (with customers, suppliers, business partners). Innovation is key to all three. "It's not simply a matter of the next new invention," she says. In many cases, innovation has nothing to do with the core product. It can take the form of the "clever application of brainpower to a unique business strategy....

"Innovation comes in organizations that are open to ideas coming from any place," says Kanter. "Tapping into people's creativity requires a spirit of play."

Here are five phenomena Kanter sees driving global business.

Increasing mobility of the resources needed to do business, including capital and labor. "In the new global economy, the migrant workers are knowledge workers [and] business managers."

Simultaneity: The best and the latest can be known anywhere in the world. The upshot? Everything—every product launch, every new marketing campaign—needs to be done everywhere at once.

Bypass: The threat for most companies is not from head-to-head competitors but from small niche companies offering customers something different.

Reuse: The ability to sell the same thing more than once—to extract more value from things you already have.

Brand power: "When customers have a proliferation of choices, brand brings them back."

Are you fostering creativity in your organization? Tell us about it.

Abbie Lundberg

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CIO

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In Box

LEARNING THE HARD WAY

First Person

A VIEW FROM THE FRONT LINES

Moving Lessons

A former CIO looks back at life during a corporate relocation

BY ALBERT E. DIETRICH III

After reading Albert E. Dietrich III's column on corporate relocation and the effect it had on the IS department ["Moving Lessons," *CIO* Section 1, June 15, 1998], I had to pause and try to remember if I had written it myself. It was like an episode of *This Is Your Life.*

Six months after joining our organization, I too was "surprised" with the news that we were relocating our corporate headquarters from South Florida to the Midwest. This was smack dab in the middle of a relatively large implementation project to replace core accounting and logistics systems. Not only did we leave behind some talented IS staff, but we also lost a user base of vast business knowledge that was crucial to our implementation.

Our IS turnover rate for the first year following the move was close to 40 percent, and before the end of the second year, there was literally no one left in IS who predated the move. Needless to say, our implementation was not exactly completed on schedule.

Unlike Mr. Dietrich's department, we did not receive a disproportionate amount of blame for the turmoil. We did, however, experience a great deal of second-guessing of our selection of systems by new employees who had not been involved in the selection process. To their credit, company managers stayed behind the project, making the journey almost bearable. To say that it was a learning experience would be a slight understatement.

I found a great deal of humor and satisfaction reading the column as I came to realize that companies far larger than ours don't seem to be any more adept at the exercise than we were. And I thought it was just us.

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CHECK THE CONSTITUTION

In his July 15,1998, publisher's note [In My Opinion, *CIO* Section 2], Joseph Levy blames the FCC, Congress, AT&T and MCI for the reductions in Internet grants to schools and libraries. The issue is not whether the program is needed or even a good idea. The issue is that the Constitution requires that Congress enact taxes.

The FCC is not empowered to levy taxes. If this is such a good idea, with widespread support among the people who elect the Congress, go to the Congress and get them to pass a law authorizing the tax. I suspect that's why the FCC tried this end run in the first place. Congress did not see any merit in yet another Big Government intrusion into the education system.

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CORRECTION

In "Potential Partners: Sizing Them Up" [*CIO* Section 1, Aug. 1, 1998], we listed the wrong title for Mark Belk and incorrectly identified his company. Belk is vice president of information technology for Kimball International, a manufacturer of home and office furniture and an assembler of electronic components. We regret the error.

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ASK THE EXPERT

Have a question about e-commerce technology? You can pose it to Richard Cannon, president and CEO of Renaissance Interactive Inc., through our Ask the Expert Web series. From Sept. 1 to Sept. 15, Cannon will be available to offer tips and advice about e-commerce applications and other Web development trends. E-mail him your questions at *asktheexpert@cio.com.*

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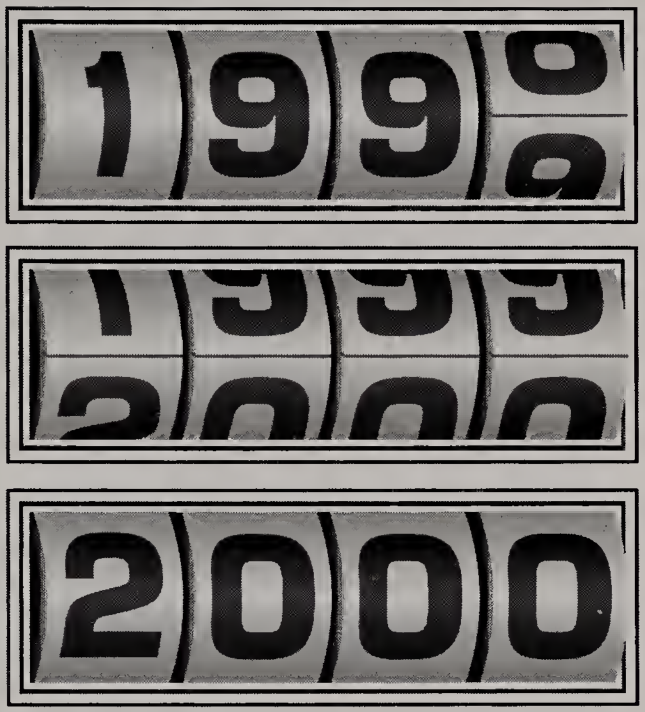

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Publisher's Note

Welcome to the third stage of the Web.

The first stage began and ended in 1995 and will be fondly remembered as the stage where it was cool just to have a Web site. The second stage, from 1996 to 1997, was the bells-and-whistles stage, where we all tried to cram as many dancing applets on our home pages as possible.

Thankfully, reason won out. Here in mid-1998 we are firmly in the third stage of corporate Web development, a stage characterized by simplicity, ease of use and customer-centric design. Gone forever are the days where it took 20 minutes to print a Web page because the upper left corner of the document was designed in solid black.

Do this: Put on a customer's hat and log on to your company's home page. Is that your company digitally represented on the screen? Or is it someone else's? How well are your high-margin products and services displayed on the initial page? How many pages must a customer drill down on to get a real name, a real telephone number, the real e-mail address of someone who works at your company?

Yes, a lot of work remains to be done.

Your company has a corporate persona, a brand that differentiates you from your competitors. Does your home page quickly convey the advantages of doing business with you? Does your site communicate to visitors that your company wants to do business with them?

What products and services are highlighted on your home page? I recently visited with the top executive of a major long-distance telephone company. I queried him about the profit margins of his residential versus corporate business. "A no-brainer," he replied. "We make the bulk of our profits from the corporate sector." I then handed him a printout of his home page and challenged him to show me where on the initial page the corporate sector was represented. He had no answer.

Put your high-margin products and contact information at the entry to your site. Don't bury them three layers down in some slash this, slash that HTML space! The Web is still a communicative vehicle, and the more your site links your customers and employees, the more successful you will be.

What are you doing to make your Web site an intuitive extension of your company? Send me an e-mail to the address below.

Gary J. Beach

Gary J. Beach
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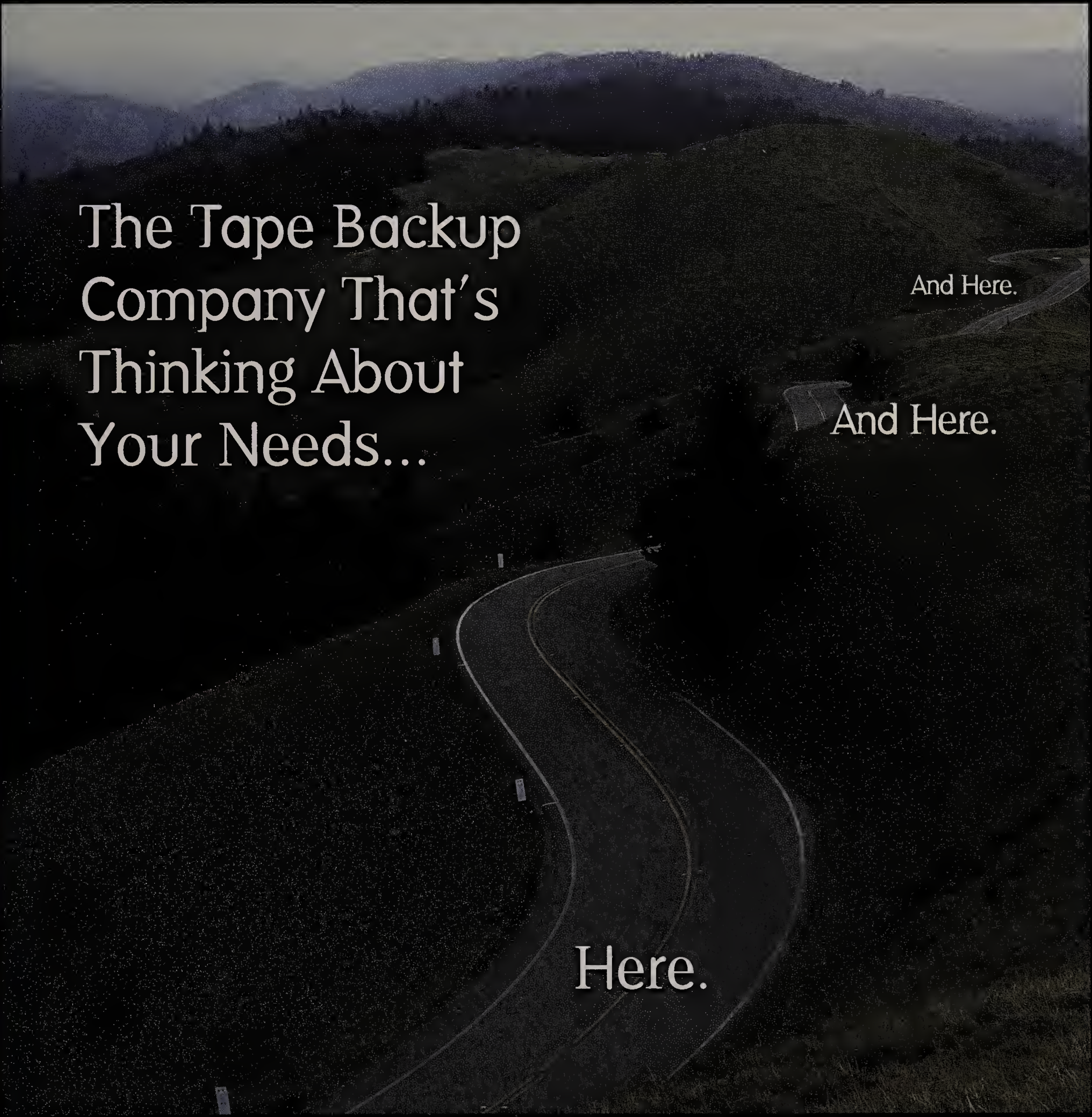

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Trendlines

NEWS, INSIGHT, HUMOR, REVIEWS

Edited by Katherine Noyes

Removing Violations

E-MAIL In the securities industry, the relationship between brokers and clients is everything. But until recently, that bond has been—how shall we say?—technologically impaired. The problem: e-mail. Or rather, lack thereof. Securities and Exchange Commission (SEC) rules require firms to monitor all communication between brokers and clients, but brokerages simply haven't had the means to adequately monitor e-mail messages for potential securities violations.

But vendors are coming to market with new products designed to bridge the gap between brokerages and the Information Age. One such tool, Assentor, manufactured by Fairfax, Va.-based SRA International Inc., is a server-based e-mail screening system that reviews outgoing and incoming messages in search of words or phrases that could expose companies to SEC violations such as stock hyping, insider trading or high-pressure sales tactics. Examples of phrases the software will flag include "You must do it," "Opportunity of a lifetime" and "Any purchases you make will help drive up the stock price."

Beyond just a keyword search program, however, Assentor evaluates the context in which language is used, allowing it to distinguish, for example, between a sentence stating, "This is the tip of the iceberg," which would not warrant a red flag, and a sentence stating, "I've got a stock tip for you," which could denote insider trading or a

It's Alive!

ROBOTICS As a kid, did you ever wish you could create a robot to do your chores? The Lego Group, Denmark-based maker of those multicolored interlocking bricks that have jammed many a vacuum cleaner, is bringing children a step closer to realizing that fantasy with Mindstorms, a kit that lets kids build programmable Lego robots.

The heart of Lego Mindstorms is the RCX, a special Lego brick embedded with a microchip that children can program with a PC. After building a robot using Legos, kids create a program for it using RCX code—a simple programming language—on a PC. They then download their program to the RCX brick using a special infrared transmitter. The creation then comes to life, totally independent of the computer. Kids can program a robotic rover, for example, that can follow a trail and move around obstacles. They can also visit *www.legomindstorms.com* to get new project ideas, share strategies and programs, and display their own robotics home page.

Mindstorms is the result of a decade of research and development at the Media Laboratory at MIT in Cambridge, Mass., from which Lego obtained the rights to use the technology. "You can't just give children knowledge. We believe that children learn best when they build their own theories of how the world works and try them out by building their own inventions," says Mitchel Resnick, associate professor of learning research at the MIT Media Lab. The Mindstorms package includes a CD-ROM, more than 700 multicolored Lego pieces, the RCX, an infrared transmitter, light and touch sensors, motors, gears and a building guide. It will be available this month and will sell for around $200.

Now if they could just invent a robot that does homework.... ■

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high-pressure sales pitch. If a red flag is spotted, the offending message is routed to a designated manager for further review. Assentor also allows companies to archive e-mail messages, as required by the SEC.

Scott & Stringfellow Inc., a Richmond, Va.-based investment firm founded in 1893, touts itself as the oldest brokerage in the South, and its executives like to think of the firm as among the most progressive. But Scott & Stringfellow's 275 brokers were denied e-mail access until nine months ago, when the company installed the Assentor system. Since then, the brokerage's clients have enjoyed easy access to brokers, and Assentor helps managers keep a handle on electronic communication. Rather than read all of the brokers' e-mail messages—hundreds per day—managers now see only 20 percent that are flagged by Assentor. "It's a big [management] help," says Derek Brooks, Scott & Stringfellow's manager of applications development.

Although Brooks describes e-mail as "essential" to brokers, the securities industry hasn't quite caught up to that realization. Of the 5,300 brokerages registered in the United States, only 10 to 15 percent now offer the option of e-mail communication to customers, says Larry Tabb, group director of the securities and investment practice for The Tower Group, a Newton, Mass.-based financial analyst. But that number is likely to increase, Tabb says, as brokerages find tools such as Assentor to keep e-mail communication within SEC compliance. The ultimate driver of e-mail ubiquity, though, will not be technological innovation but rather the same force that has driven the securities industry since forever: market demand. "[E-mail access] isn't necessarily what the brokerages want; it's what the clients want," Tabb says.

–Tom Field

15 MONTHS
Y2K
COUNTDOWN
& COUNTING

What Comes After Y2K?

Take a moment, if you will, and indulge in a little futuristic daydream. It's a couple of years from now, and your Y2K and Economic and Monetary Union (EMU) remediation projects are complete. Ahh...sigh of relief.

OK, now it's time to wake up. Unfortunately, this daydream won't come true. In fact, you might as well prepare for a few more conversion nightmares.

DOW JONES 10,000

For the last quarter-century or so, the Dow Jones Industrial Average (DJIA) has been a four-digit number, and computer systems that track it have been written with this in mind. With the booming economy, the DJIA has been approaching the realm of five-digit numbers. (For more on the Dow Jones 10,000 problem, see an item forthcoming in Trendlines, *CIO* Section 1, Sept. 15, 1998.) But consider this irony: The year 2000 bug may slow down the economy enough that you won't have to worry about the DJ10K for several years.

STOCK EXCHANGE DECIMALS

Last year the New York Stock Exchange Inc. board of directors approved a plan to convert to trading in sixteenths rather than eighths as a preliminary step to trading in decimals instead of fractions. The goal: to help the individual investor understand prices. Originally, this was to have been done by this summer, but because of Y2K-related delays within the securities industry, the target date was pushed back to the end of this year.

ZIP CODES

If your company frequently uses the mail, you can currently take advantage of 11-digit ZIP codes. The last two digits are embedded in a bar code in the mailing label and you can get a nice discount by including them. According to United States Postal Service spokeswoman Sandra Harding, they enable mail to arrive at the local post office in the order the carriers take on their routes. "I don't think it's going to go any further," says Harding, "but I was told when we did nine digits that we wouldn't do any more after that."

It may seem that we're passing along this information just to aggravate you. Not true. We're trying to prepare you. When PRT Group Inc., a New York City-based testing laboratory, was hired to work on a major Y2K conversion, part of the deal was that the conversion tools it either bought or built had to be reusable. "We could not build this just for Y2K," says PRT Group Director of Client Solutions Bob Morin, who used tools from Micro Focus, Intersolv (now owned by Micro Focus) and McCabe Associates to create a generic testing tool that could handle what he terms "mass change." "You have to think about testing in a whole new way," Morin warns, urging CIOs to think about how they can reuse their testing tools to create a repository of data that can help test other conversion projects—because they're certain to come along.

Is there any good news? Sure. We also checked with the North American Numbering Plan Administration and the Social Security Administration, and both report that we're set on phone and Social Security numbers at least until 2025.

–Howard Baldwin

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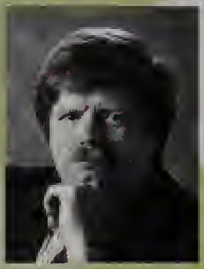
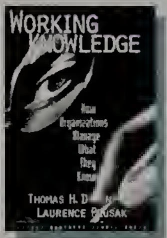
TUESDAY KEYNOTE



Thomas Davenport
Professor of Management
Information Systems
School of Management
Boston University



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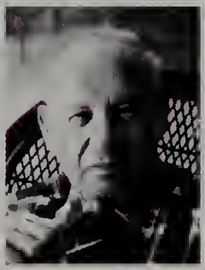
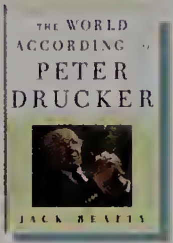


Peter F. Drucker



"While Drucker famously denies he invented modern management, claiming that the idea is nonsense... he has most certainly spawned the major management ideas of this century. And this book, beautifully written and fascinating throughout, does Drucker justice by presenting an omnibus of his ideas with clarity, wit and critical appreciation..."

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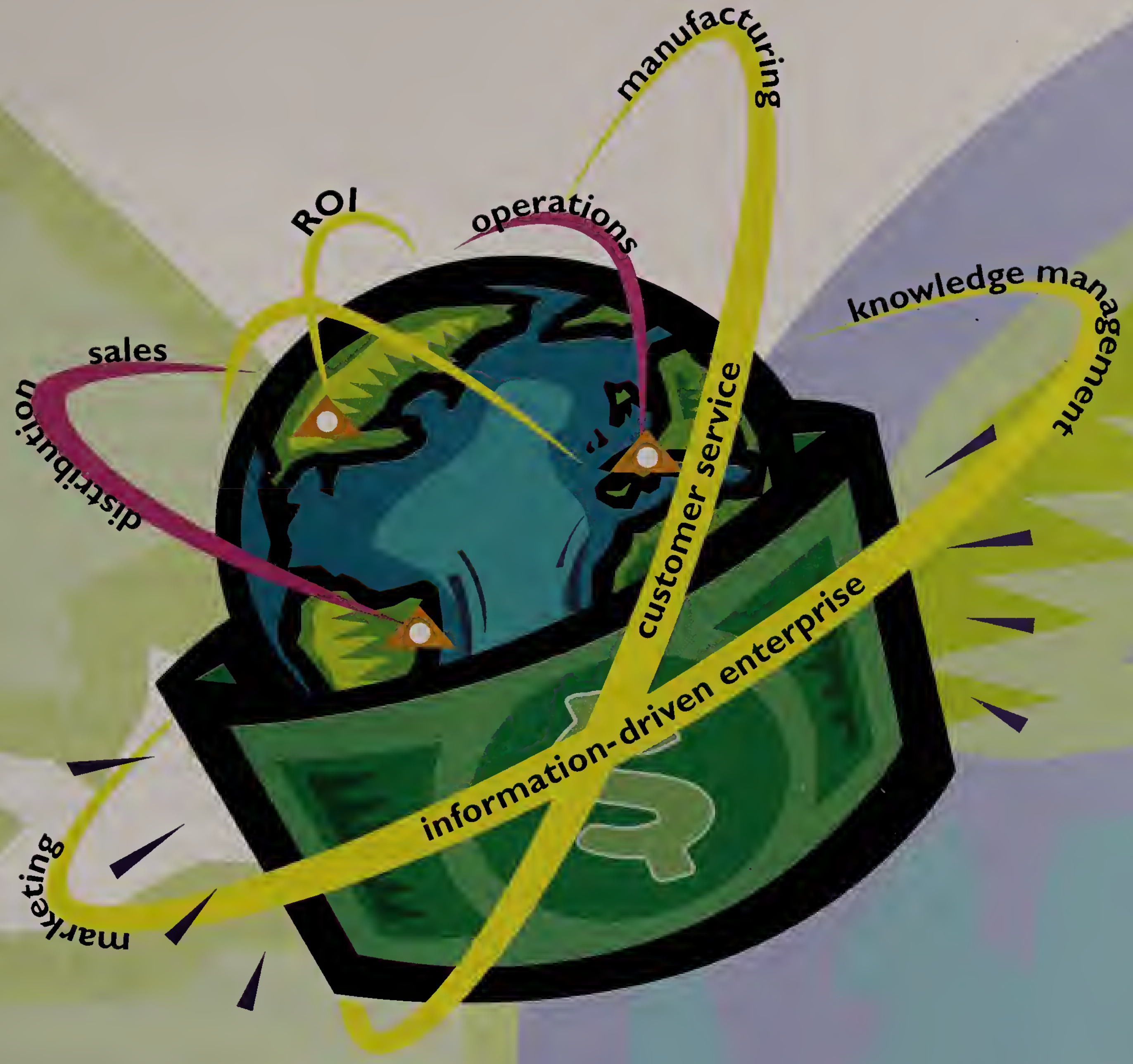

The Value of Enterprise Information as Business Currency

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Trendlines

Field of Teams

GLOBAL TEAMING At companies that operate globally, CIOs are often charged with the task of aligning technology across not only business units but also countries and cultures. Global teams frequently play a key role in such efforts; their members' multinational sensitivity, cultural diversity and shared vision can help motivate local buy-in to the project at hand. (For more on global teams, see "Team Heat," Page 42.) That's when they work well, which is not always the case. In addition to time and distance problems, cultural issues can make it difficult for global teams to work together.

What follows are 10 strategies—culled from discussions with consultants, analysts and global executives—for making your global team a success.

ILLUSTRATION BY ROB DUNLAVEY

① INCORPORATE DIVERSITY.

Recruit team members from across geographic lines, business functions and corporate experience. Diversity is a powerful tool when you're trying to gain buy-in to the project across the enterprise. It also brings insight into local conditions that may affect a project's success.

② BUILD TRUST.

Take time to cement relationships among members. Plan regular get-togethers, especially meals away from corporate premises. Such activities help transform "us" and "them" into "we."

③ CREATE TEAM IDENTITY.

A team Web page on the corporate intranet or special programs to gain the group corporate recognition will heighten participants' sense of importance in the company.

BACK-TO-SCHOOL BLUES

In addition to noisy roommates, bad cafeteria food and all-night study sessions, *college students* today have another problem to worry about: repetitive strain injury (RSI). A study at Carnegie Mellon University shows that *22 percent* of its students, faculty and staff report symptoms of RSI, and the same phenomenon is being reported at other *institutions*. Says Anita Barkin, director of student health services at Carnegie Mellon, "Students are using *computers* earlier and earlier. They are using them in elementary school and in *high school*. By the time they come here, they've already gotten into some *bad habits* and have not been aware that RSI is a problem."

SOURCE: *THE WASHINGTON POST*

④ BUILD CONSENSUS.

Make sure that members at all levels share the corporate vision; otherwise, you'll keep coming back to that issue every time there's a disagreement. Don't underestimate the value of confrontation. If used correctly, it keeps issues from festering and sabotaging success.

⑤ TEACH SENSITIVITY.

Formal instruction goes a long way in eliminating ignorance that could set a project back. When everyone is in sync about the proper protocols for processes that differ from one location to another, the project runs more smoothly.

⑥ ESTABLISH GROUND RULES.

To avoid misunderstandings and

~~CRISIS~~

MANAGEMENT

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frustration, global teams need to follow common ground rules for communication, dealing with conflict, running meetings and other project activities. If necessary, bring in a facilitator to help identify significant differences among members and suggest the most effective rules for the group.

⑦ **BE FAIR.**
Be consistent in compensating team members. They will talk. Boost morale by offering incentives when they meet project milestones.

⑧ **COMMUNICATE PROGRESS.**
You can never communicate too much. Make sure you share critical data among team members in a timely fashion. Keep management or other interested parties aware of successes and setbacks. Toot your own horn when things go well. Solicit new ideas when you're stymied. Flag problems that need resolution.

⑨ **DESIGNATE RESPONSIBILITY.**
Especially when time and distance separate participants, it's easy for tasks to fall through the cracks. You can avoid a lot of finger pointing if you document exactly who is responsible for what.

⑩ **GO FACE TO FACE.**
No matter how well you keep in touch, time and distance often cause minor problems to escalate. It's important to get global team members together in one location on a regular basis. That promotes more productive brainstorming and helps participants iron out difficulties, realign priorities and, most important, reinforce a sense of community and common purpose.

–Debby Young

Findings **Call Centers**

A Call to Arms

If your company is like most, it needs to do a better job of equipping and training its call center agents. That's according to a recent study, based on phone polling of 55 executives overseeing 62 call centers, conducted by OmniTech Consulting Group Inc. of Chicago.

Among the survey results from which the company drew that conclusion:

- High employee turnover is a chronic problem. The average turnover rate for call centers is 24 percent.
- Customer-centric operations are still rare. Most call centers gauge performance using easy-to-measure metrics such as average speed of answers and length of calls, but fewer measure call center agents' soft skills. This, according to the study's authors, suggests that call center managers are just beginning to recognize the impact of agents' soft skills on customer loyalty and competitive advantage.
- Call centers are in a state of flux. Sixty-four percent have undergone at least three structural changes in the last six months; fewer than 10 percent have undergone no structural changes.
- Massive internal restructuring is the norm. Seventy-eight percent of the companies represented have established new workflow processes and 75 percent report new systems installations within the past six months. Reorganizations and consolidations are also common.
- Rapid change in the industry will continue. Sixty-seven percent of call centers plan new workflow processes in the next six months, while 62 percent are planning new system installations.

"All these dynamics ultimately affect the day-to-day work of call center agents, who represent the voice and face of the company to many customers," write the study's authors. "Their performance is crucial because escalating competition necessitates not just high quality, but perfection."

The study primarily targeted large call centers—averaging 262 agents—that process complex transactions. Respondents were the most senior person in the company responsible for the operations of the call center. Typical titles included vice president of customer service, director of member services, director of corporate call center and senior vice president.

The study points to increased agent training and adoption of telephony technologies as key to stabilizing call centers and transforming them into competitive differentiators. At the same time, it notes that call center agent training among survey respondents was often inefficient and expensive—respondents spend $1.7 million a year on that activity—the bulk of which (84.5 percent, on average) consists of various hidden costs not typically included in the training budget.

For more on the study, visit *www.otcg.com.*

–David Pearson

Class Conscious

Technology-based training of new employees is still rare in call centers

Training Method	Percentage Using It
Classroom	61.9
CD-ROM	1.4
World Wide Web	0.4
Other	36.3

SOURCE: OMNITECH CONSULTING GROUP INC. RESPONDENTS WERE 55 EXECUTIVES OVERSEEING 62 CALL CENTERS.

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TOM PETERS' CIO MANIFESTO

REINVENTING *the* world

PHOTO BY STEVE HILL

What management guru Tom Peters doesn't know are the rules of the game that will be played by CIOs in the coming years. What he does know is that CIOs are in charge of reinventing the world. Peters, co-author of *In Search of Excellence* (Harper & Row, 1982) and author of *The Circle of Innovation* (Knopf, 1997), addressed a group of over 800 IT executives at the CIO Perspectives conference in Orlando, Fla., in April. He wrapped up his expansive hour-long talk by issuing 10 pieces of advice. Peters calls them his CIO Manifesto.

1. **My name is Che Guevara.** If I am not prepared to stake my professional life on the concept of revolution, I do not deserve to be employed in an information systems activity.

2. **I don't go gaga over the business case.** Most corporations don't have the innovative potential to hack their way out of a wet paper bag in the middle of a monsoon. My role is to lead.

3. **I know that the very young will lead us.** I am a connoisseur of talent. I dote on weird, weirder and weirdest.

4. **I believe that the promise of ERP/supply chain management is underhyped.** The Internet is underhyped. Value chain/supply chain management, ERP, the Internet, etc., will devour all of the current ways of doing business, private and public, and change the definition of every industry.

5. **I believe that the real legacy systems that have to be changed are those that involve the corporate culture.** I will attack the slippery cultural issues head-on. I am a CIO; I am not a technologist but rather an anthropologist. I can learn more from studying Gandhi, King and other community and social activists than I can from going to another meeting of geeks.

6. **I will think beauty, think aesthetics, think designs.** Every project should be able to pass the beauty-aesthetics test.

7. **I must slow down and think.** I will take time to reflect and go trout fishing. There is no evidence that the tools I am developing have made people smarter and more thoughtful. If anything, the evidence may be on the other side. The next time I think about going to my ninth industry conference of the year, I will go trout fishing instead or spend four days in the garden.

8. **I will never get it right.** I aspire to beautiful metasystems in which all of the internal and external slack is extracted from the value chain, but I also know that a generation on the Internet is a few months at most. Beautiful, coherent architecture makes me swoon, but it is at the same time a hopeless snare and a dangerous delusion. Beauty is my mantra, but "Ready, Fire, Aim" is my calling.

9. **I will minimize benchmarking against my traditional rivals.** I will start looking for the four-sigma freaks assiduously. My goal: We do not want to be the best of the best, we want to be the only ones who do what we do.

10. **I am not a wimp.**

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LESSONS LEARNED FROM PEOPLE IN THE KNOW

It Takes Two

Combining your company's quality assurance program with training efforts can be an innovative way to give customers the high-quality deliverables they demand while creating a skilled, motivated staff

BY JACK BUCSKO AND PAT DELOHERY

IMPLEMENTING QUALITY assurance (QA) processes in any organization is difficult. Everybody agrees that, whether a company produces widgets or software, it's the *sine qua non* of the working world. Trying to find the funding to implement a comprehensive QA program is sometimes even harder than getting the money for that boondoggle conference in Honolulu.

Like QA, training is vital to a company's future success. But as soon as the belt tightens, training programs get axed because their impact on the bottom line appears only as a cost. We at DMR Consulting Group Inc. have found that combining forces for these two critical functions often provides strength that is otherwise unavailable. It provides measurable results in a reduced number of defects, increased skill levels for new IT positions and knowledge based on practical experience, all of which occur during the delivery of productive work.

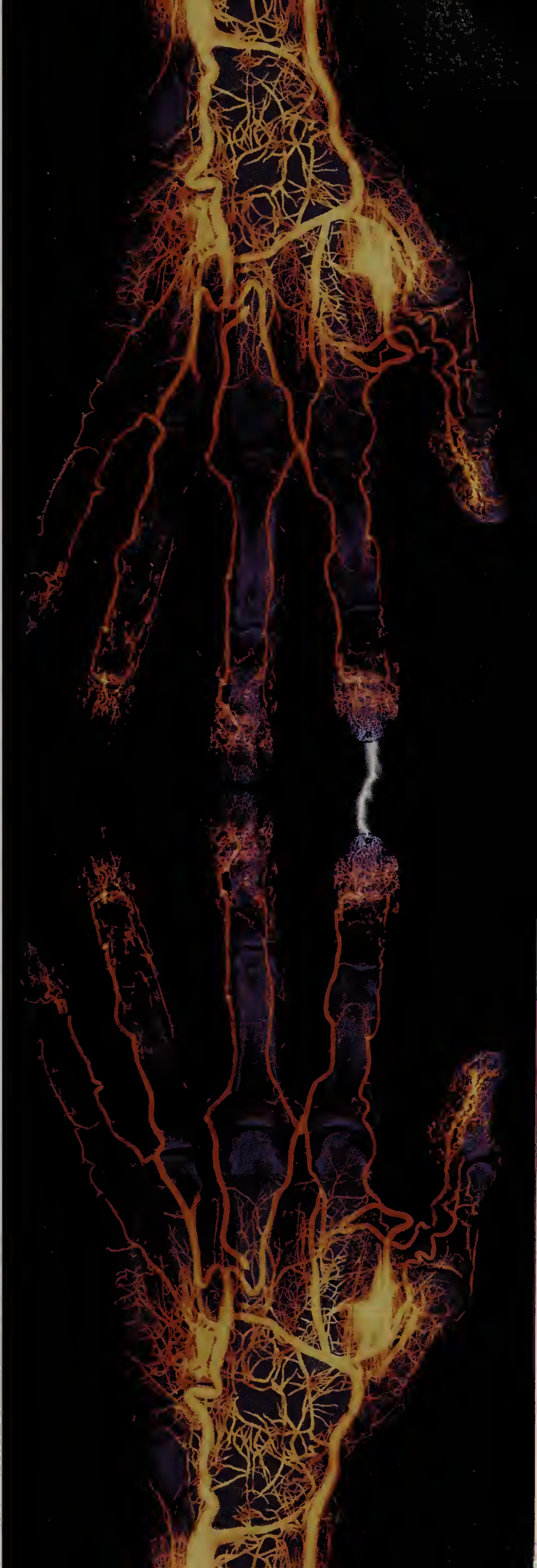
CORNER IMAGE BY CARL TREMBLAY; ILLUSTRATION BY POL TURGEON

The strength of a well-trained team increases because a good training program combined with QA results in multiple people cross-trained in several positions, significantly reducing the impact of a team member leaving. In fact, merging a QA process with a training program can allow an organization to implement both with minimal investment, resulting in tremendous benefits to the company.

A case in point: DMR's year 2000 services team in its Business Solutions Center in Atlanta is required by the needs of a diverse customer base to solve a wide variety of technical tasks in a dynamic and ever-changing environment. The year 2000 field is evolving rapidly, with the frequent addition of new or enhanced products and tools for analysis, conversion and testing. Customers needs constantly change, and there are frequent modifications in the ratio of mainframe to client/server code in-house.

The technical staff is asked to respond quickly to these requests and to develop a number of skills on the fly. The work itself is quite exacting, requiring multiple QA checkpoints and diligent, painstaking manual verification of tool-produced output. In addition, the demand for qualified technicians creates a highly competitive job market in which attracting and retaining employees is a key factor in long-term success. An innovative approach to our QA and training challenges has helped us to address our business needs while providing our employees with career-enhancing training.

Our solution: to combine the QA and cross-training functions, using the same staff members who are performing the Y2K work. We've developed a fluid organization with a minimum of formal structural hierarchy, loosely



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grouped by employee skills into core teams of mainframe and client/server specialists. In addition, the team members are further distinguished by a primary expertise in a phase of the Y2K process (inventory, assessment, planning and so on).

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In the beginning, each specialist or group of specialists works in their areas of expertise. Each step of the process is verified by another team member who is familiar with the work done but who has not yet participated directly in its completion. In this way, each team member learns every phase and task of the Y2K process in depth.

The QA process was developed by senior staff members (a process manager responsible for process definition and adherence, training and methodology, and a senior team leader with years of QA, programming and management experience). They refine the process and checklists on an ongoing basis in close interaction with staff members, who are encouraged to recommend process improvements. Missed items and new ideas are incorporated into the QA process as they're identified. The QA function, with its processes, procedures and checklists, affords an excellent way to provide staff with hands-on experience in a new area without requiring at the outset a deep level of expertise or subjecting a project to undue risk. Using the QA process in this way accomplishes two goals: a high quality product and a more knowledgeable cross-trained team member.

The QA function, with its processes, procedures and checklists, affords an excellent way to provide staff with hands-on experience in a new area without requiring at the outset a deep level of expertise or subjecting a project to undue risk.

Many of the team members are intent on acquiring other skills, but most mainframe assignments don't provide much opportunity for staff members to acquire client/server technology skills. The Y2K factory, on the other hand, lets mainframe and client/server specialists work side by side, performing similar or identical functions—often on the same application.

The proper combination of formal training, computer-based training (CBT) and mentoring will give a mainframe technician sufficient expertise in the C language to be a productive member of a client/server Y2K team. The practical experience begins with a QA role: Knowledge gained during the QA process enhances the "book" training and enables the staff member to grow into an analyst position. Due to the nature of Y2K analysis and conversion tasks, this approach provides an excellent training ground for a later production support or full development position on a client/server project. It's a solid career progression.

There are three primary advantages to this approach:

- Low cost. It is possible to implement comprehensive QA and training programs with little or no incremental investment. It may be necessary to acquire some training materials and to allocate staff time, but the incremental costs will prove to be negligible.
- Practicality. The training employees receive is enormously practical and, unlike many "pure" training programs, it addresses existing needs.
- Win-win. A synergistic result is produced: The project receives extensive QA, while at the same time the employee enhances his or her career, learning new skills while fulfilling a meaningful role on the job.

Of course, this approach can present a management challenge or two. It is no small feat to coordinate such a program, and the larger the group, the more difficult it becomes. The optimal size of an organization for this approach, to be managed as a single effort, is probably in the 10- to 50-person range. Any larger than that and it would be best to implement the program in a smaller group, extending its scope as the affected staff make the adjustment. The process can be managed in the smaller groups, with a coordination function at the higher level to allow for a bird's-eye view and to allow employees to move from group to group as needed.

In addition, it's important to regulate the movement of employees from one group or technology to another. If it happens too fast or with too many people involved, it will adversely affect the project's goals and outcomes. One solution is to use the program to identify leaders and others who are ready to move on and extend the option to them as an incentive in recognition of superior performance.

While this application focuses on a Y2K factory operation, the approach is valid and workable for all software development. The key to success is the identification of opportunities to address employee training needs (as well as the staff's personal career goals) by making QA an integral part of the training process. By combining the path to both delivery and employee career growth, and making QA an undisputed and indispensable step on that path, QA and training will rightfully be recognized as providing significant cost savings. The major cost savings accrue because the team members are productive while they are being trained and the product delivered to the client is of high quality. Combined correctly, QA and training can go a long way toward ensuring long-term profits and success.

Jack Bucsko is director of Year 2000 Services at DMR Consulting Group Inc. and Pat Delohery is principal director of DMR's QA and Testing Competency Center, both in Atlanta. They can be reached at jack_bucsko@dmr.ca *and* pat_delohery@dmr.ca.

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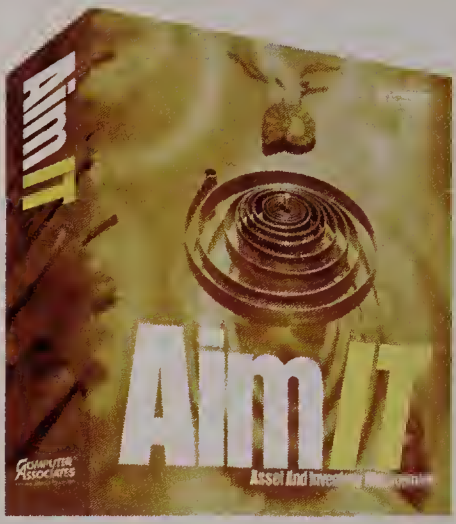

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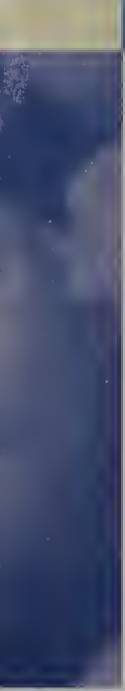


It's not every day that a CIO finds himself in a position to help his company through a major public relations nightmare.

A few years ago $2 billion Potomac Electric Power Co. faced a public outcry over accusations that the Washington, D.C., utility was giving customers in the tony suburbs priority over inner-city customers when it came to fixing power lines downed by storms. Concerned citizens took their case to a Washington commission, which began an investigation.

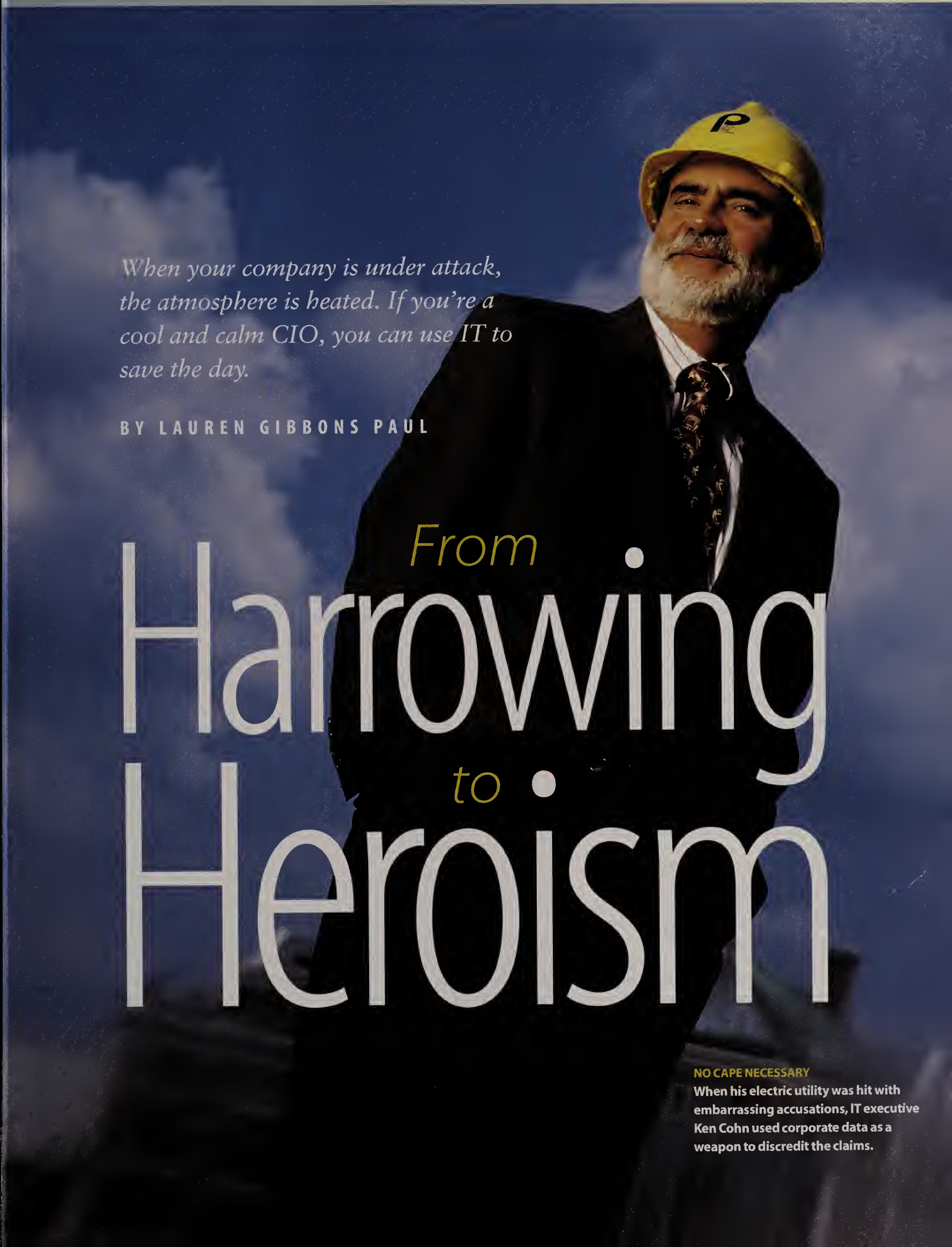
As general manager of computer services, Ken Cohn was the utility's highest-ranking IT executive. He went before the commission to show how the company prioritizes outage repairs. When a resident calls to report lost power, the mainframe-based system maps the outage and tracks the problem to the local generator. It brings up a schematic of all the homes and businesses likely to be affected. Finally, taking into account mitigating factors (simultaneous problems, the number of people affected and whether there's a live wire on the ground), the system dispatches repair crews.

Reader ROI

CAN YOUR I.S. DEPARTMENT MOBILIZE quickly to deal with a crisis? Prepared CIOs stand ready to use information as a tool to help their companies recover from nightmares of any kind. This article will show CIOs

- How to put together a plan for crisis management
- Why they should be the linchpin between security, public relations and executive staff
- How to boost responsiveness to customers and the media

PHOTO BY KATHERINE LAMBERT



From Harrowing to Heroism

When your company is under attack, the atmosphere is heated. If you're a cool and calm CIO, you can use IT to save the day.

BY LAUREN GIBBONS PAUL

NO CAPE NECESSARY
When his electric utility was hit with embarrassing accusations, IT executive Ken Cohn used corporate data as a weapon to discredit the claims.

LIGHT ON HIS FEET **EchoStar CIO Tom Ryan faced an unexpected shift in his company's business model.**

PHOTO BY CHRIS SHINN

After seeing a demonstration, commission officials were satisfied that the utility was dispensing service according to a fair system. "We were able to prove that the power outages were being fixed on the basis of established priorities rather than by neighborhood or income level of the residents," says Cohn. In the eyes of Potomac Electric's executives, from the CEO to the public relations staff, Cohn was a hero for his quick action in averting further erosion of consumer confidence. Cohn was understandably proud of his information system's ability to demonstrate the integrity of the company's business practices.

On any given day, your company can be struck by the unexpected. Potential catalysts include business reversals, weather conditions and catastrophic product defects (witness the recent deaths from defective dialysis tubing and tainted juice). In a heartbeat, your executive colleagues' workload is tripled. They need to solve the problem, handle the media and the public's perceptions and, oh, by the way, keep the company running. To do that, they need information. And who keeps the keys to the information? You.

As custodian of corporate data, "the CIO is uniquely positioned to support the crisis management effort. Information serves as a basis for developing the game plan" before, during and after the fact, declares Larry Kalmis, director of business continuity solutions at Bell Communications Research Inc. (also known as Bellcore) in Morristown, N.J.

The key hearkens back to scouting days: Be prepared. When unexpected events occur, tempers flare and stress levels soar. No one is operating at optimum mental capacity. That's when the CIO needs to step in. Information helps cut through the confusion and keeps the business running. We talked with IT professionals and consultants who've dealt with crisis in both theory and practice. Their consensus for survival: With a team and a plan in place, you can work wonders.

PUTTING TOGETHER THE TEAM

The heart of any crisis management plan is the group that will take over when an event is underway. Experts agree the team must be multidisciplinary and have representatives from IT, operations, public relations, human resources and security. The CIO should not head the team, suggests Barbara Reagor, senior director of risk management solutions at Bellcore. "We look at the CIO as being the team champion, not the team leader. The leader needs to be at a different level," she says.

Depending on corporate culture, that person should be the CEO or COO. If the crisis is of high public profile, it will likely be the CEO who must step in and calm the public fears. "It is important that management as a whole realizes that at the time of a crisis, be it a physical event, disruption of facilities or a PR event, a different organizational structure takes over to manage the problem. That should be a functional structure as opposed to a departmental one," says Kalmis.

Along with identifying the crisis leaders, the team must also figure out who will keep the business operating during the situation. For example, in 1991, just minutes after a gunman opened fire on patrons at a Luby's Cafeteria in Killeen, Texas, the CEO said he would handle the crisis and turned the rest of the company's operations over to his second in command. "That was wise because you can't focus on both the crisis and the day-to-day duties," says Kalmis.

At the same time, it's also important to remember that sometimes crisis response can be handled within your own department. As CIO, you may be called upon not just to facilitate the spread of information but to engineer a major change in the way the company does business. In the middle of last year satellite dish provider EchoStar Communications Corp. faced a major crisis when a deal between the company and media mogul Rupert Murdoch went sour (the failed deal is now the subject of litigation). In the months leading up to the collapse of the deal in April, EchoStar had altered its business plans in reliance on News Corp.'s promised $1 billion investment. With the additional capital gone, the company needed to regroup.

"Just about every analyst on [Wall Street] gave us only a few weeks to live," says Tom Ryan, CIO of EchoStar in Littleton, Colo. It became clear to corporate executives the company would need to take radical action in order to stay afloat. Recognizing that cost was the biggest barrier to getting new satellite dish subscribers, the company cut the consumer's upfront investment from $499 to $199.

To make the new deal profitable for both EchoStar and its dealers, EchoStar had to adopt a new commission structure. The whole company mobilized to develop new dealer agreements, marketing materials, point-of-sale materials and other campaign matter, all targeted to roll out on June 1, which was less than four weeks away.

Ryan was a central figure in making the new deal work, since it required developing a new application for calculating payments to be distributed weekly to dealers based on activation of the satellite receivers. The requirements were steep: The new system had to be able to analyze account information for over 1 million receivers and generate thousands of commission payments each week. To avoid having to print and mail all these checks and statements each week, Ryan's team conceived a secure Web site where dealers could access payment information and receive electronic transfer of funds.

"Using a traditional approach of requirements definition, system design, development, testing and deployment would have taken months. We had to have the first components deployed within three weeks," says Brian Carnell, senior NT administrator at EchoStar. "Under [Ryan's] direction, we tried something different."

The IT team abstracted the requirements rather than going through a lengthy formal requirements definition process. Then the team defined an object-based environment that encapsulated the core functions, whose behavior could be modified through the definition of business rules. Because this approach minimized the amount of code the team had to develop, they were able to meet the June deadline.

Consider, too, the situation at American Airlines Inc. Naturally, Vice President and CIO Scott Nason is reluctant to talk about how the airline handles tragedies like hijackings and crashes. But at the same time, his team plays a substantial role in keeping customers happy when the unexpected occurs. That frequently involves weather. In the spring of 1995, a monstrous hailstorm hit Dallas/Fort Worth International Airport, damaging 55 planes on the ground so badly they were grounded for repair work that lasted from a few days to several months.

The damaged planes represented about 8 percent of the company's 641-plane fleet. Their absence wreaked havoc on a schedule that encompasses some 2,300 daily flights. Rebuilding the flight schedule on such a large scale heavily taxed the company's computer systems and processes, says Nason. "It's an intensive process that would be impossible without all kinds of processing and models," he says. The shuffling involved doing something American Airlines officials understandably hate to do—cancel flights carrying confirmed passengers, especially the frequent flyer club members, whom they view as the *crème de la crème*. "We do care more about our better customers. We've learned to provide extra special care to them," says Nason.

When passengers are severely delayed by weather or other disruptions, Nason's staff marries the operations database with the frequent flyer database to determine which of the best customers were affected (this was not done in the case of the hailstorm, however, because the severity of the storm was obvious to anyone traveling that day). Then the staff contacts those passengers, either by phone or letter, and offers apologies and in some cases additional frequent flyer miles for their trouble. This goes a long way toward nipping negative traveler feelings in the bud.

While there are situations that can be handled solely by IT, it's still prudent to have a cross-functional team in place. Since the team will be working closely under high-pressure conditions, it is crucial that team members work well together and can handle high amounts of stress. "When a crisis strikes, and it's a physical phenomenon, you're not going to be at your best," says Kalmis, noting that there can even be such primordial reactions as "fight or flight," where blood rushes away from one's head. "Given a choice between a sophisticated crisis command center with lots of technology or a management team [with members who] trust each other, I'd take the latter" because a team that works well together under pressure will gain control of the situation much more quickly, says Kalmis.

WEATHER OR NOT **American Airlines Vice President and CIO Scott Nason (left), working with Managing Director of System Operations Control Art Pappas, mollified customers of canceled flights.**

PHOTO BY DAN BRYANT

GETTING THE RIGHT INFORMATION
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of their respective holders.

Grace under pressure is hard to gauge in advance, so Kalmis and Reagor suggest having a dress rehearsal to see how everyone reacts; crisis management exercises are among the business continuity services Bellcore offers. These range from a paper study of an event to a prearranged drill to an unannounced fake emergency.

Jeffrey G. Williams, who runs seminars covering disaster recovery planning and crisis management, says the stress-testing process is no different from training a volunteer firefighter, another activity he's been doing for years. "We used to put the fireman in full gear with a bag around his head and a tape playing with the sounds of the fire and a child saying, 'Daddy, save me.' The firemen who were young parents couldn't stand it. You have to find out who can do it and who can't," says Williams, president of Binomial International Inc. in Ogdensburg, N.Y.

An Ounce of Prevention

The Web puts a new spin on crisis communication

CRISES COME IN ALL KINDS OF PACKages. Consider the situation facing beverage maker Odwalla Inc. when several children were sickened—and one died—when they drank juice exposed to E. coli bacteria. The company had already contracted with its public relations firm, Edelman, for help. According to Matthew J. Harrington, crisis sector and general manager in the company's San Francisco office, Edelman had created a "dark," or inactivated, Web site that Odwalla could customize with brand information and, in this case, the latest news and reassurances for anxious parents. Because the structure of the Web site was already in place, Odwalla was able to speak directly to consumers about the crisis the same day that the news broke. The site received more than 20,000 hits in its first 48 hours.

The practice of keeping a Web site "on ice," ready to be filled in with crisis-related content at a moment's notice, could be one of IT's best weapons in an arsenal of preparedness. Just as newspapers write celebrities' obituaries before they die, this practice lets companies respond to events in the fastest possible way, says Kevin Rowe, president of Eagle River Interactive Inc., which, like Edelman, will help CIOs and other executives set up a dark Web site to be used in an emergency. "Creating a Web site on demand overnight is nearly impossible. It wouldn't be professional-looking. You don't want it to look like it was just thrown together," he says. The service includes hosting because, Rowe notes, most Web servers don't have the capacity to handle a huge glut of surfers during a crisis. Eagle River charges $6,000 to set up a Web site; a launch costs another $6,000.

Because Eagle River has only recently launched its service, no customer refer-

PUTTING TOGETHER THE PLAN

For IT executives who have experienced and managed a crisis, there is nothing hypothetical about crisis management. Once they've survived their baptism by fire, the next order of business is to set up the crisis communication plan, which establishes a protocol for communicating during the crisis. This duty falls directly to IT, says Paul D. Porter, CEO of The Security Board in Minneapolis, because the CIO generally oversees all the systems—computers, phones and mobile devices—that enable communications. "Those systems are critical. It's not just a matter of getting the computers up and running during a crisis, it's a matter of where's the command center, how to feed information to executives at home," he says.

The need for crisis planning was etched indelibly on Michael Magee's mind on a summer day in June 1995 when he worked as a network manager at BTI (Business Telecommunications Inc.) in Raleigh, N.C. Around noon, a bomb sent by a disgruntled ex-husband exploded on the fifth floor of the building, seriously injuring two employees, one the target of the attack. Magee was on the ninth floor at the time.

"The whole building shook [as if] someone ran off the road and hit the building," says Magee, now an IT manager at Strategic Technologies Inc., a systems integrator in Cary, N.C.

Minutes later the authorities evacuated the building. Then the realization began to dawn that the company was unprepared for such an event. Over 500 panicked employees were baking in the midday sun of the parking lot, not yet knowing what caused the explosion or who was hurt. "It was pretty chaotic," says Magee. Finally, the CEO got up on a bench and gave impromptu instructions. For his part, Magee was charged with setting up an emergency call center at an employee's house. The FBI and the Bureau of Alcohol, Tobacco and Firearms would not let anyone back in the building for three days.

"We did recover our business operations, but we lost valuable time. With a good plan, you would have copies of the plan offsite and teams and backups would already be organized. This was an awakening for me. I've become an evangelist for these plans," says Magee. So much so that when he moved to his current job, he asked about the company's crisis preparedness. In response to his question, the CIO promptly put him in charge of crafting the plan.

Since not all crises are confined to business hours—as Magee's was—IT executives must gather contact information that goes well beyond routine business contact information. "The challenge is finding where everything is and how we get the most important information to the [team members] quickly," says Porter. "To get ahold of people under a variety of unusual situations where you need quick answers is paramount. Things have to happen right now."

Executives may well chafe at having to hand over their personal data such as home phone numbers, pager numbers, addresses and contact information for their closest relatives. The CIO should impress upon them the importance of this information, says Porter. Then, he advises, "gather the information and keep it in a sealed envelope to be opened only in a crisis."

ences are available. But Rowe envisions a broad array of applications. For example, the site could offer reporters the ability to be automatically paged or sent an e-mail message if information on the site changes. Grim as it is to imagine, an airline might want to build a site on which users could enter a relative's name after a crash to see if he was on board. The site could include video clips (such as the company CEO being interviewed on CNN) and other resources such as Securities and Exchange Commission documents, says Rowe.

–L. Gibbons Paul

LOCKED OUT **A midday explosion at Business Telecommunications Inc. kept IT Manager Michael Magee out of his building for three days and made him a believer in contingency plans.**

PHOTO BY SIMON GRIFFITHS

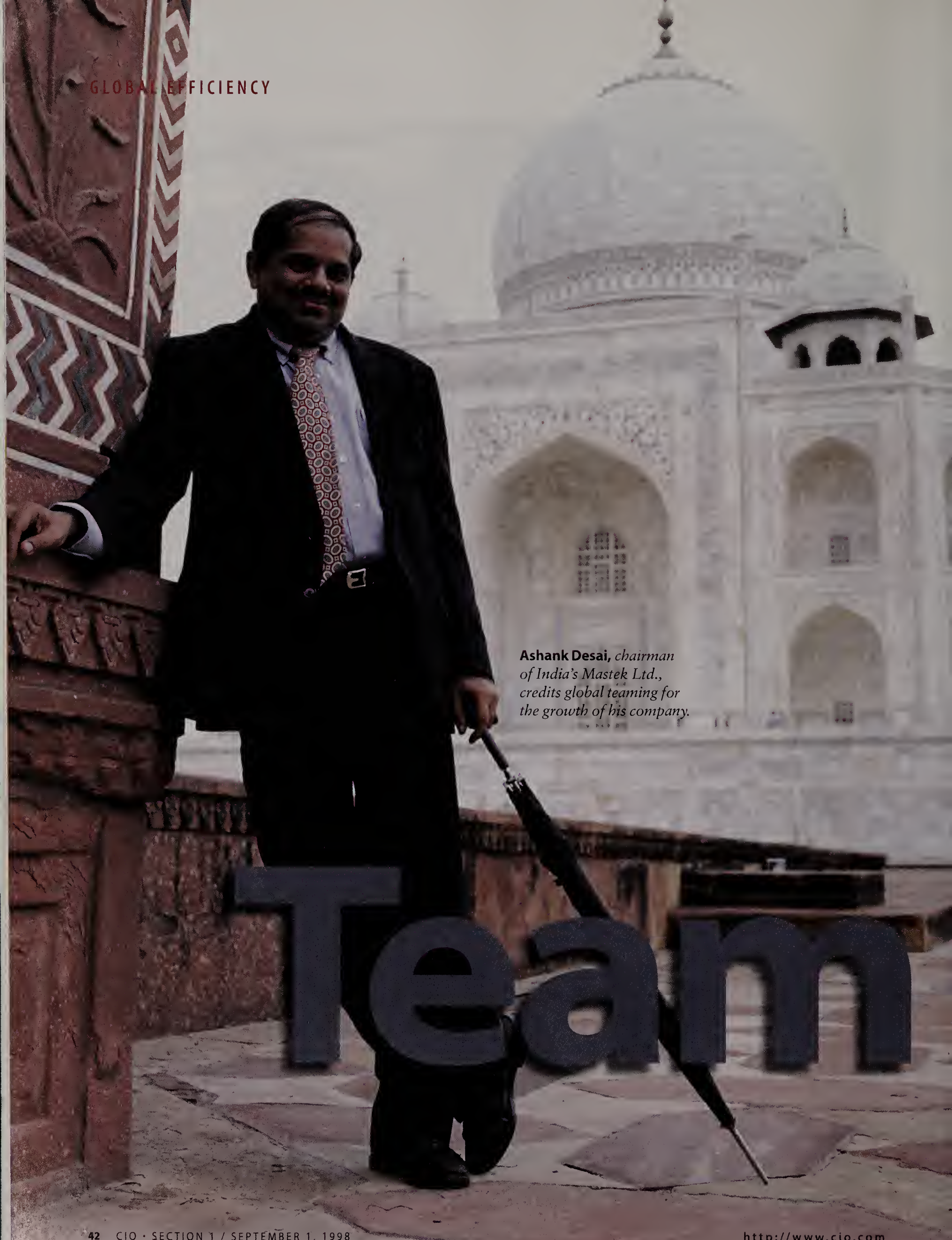
Along with the crisis communication plan, Bellcore's Kalmis and Reagor also recommend putting together a management succession plan, which spells out the chain of command if someone is unavailable. CIOs should plan to update this information at least twice a year, they say, because personnel information is so changeable. "The document will evolve according to how your company evolves. The CIO is the one holding all this together. The CIO has the information to make this a living plan because he is the best source of information," says Reagor.

TAG, YOU'RE IT

Whatever the nature of the disaster, as guardians of the corporate data, CIOs are in a position to lead the company out of crisis. Certainly, it's understandable that you might be reluctant to take on crisis-planning duties that transcend traditional data disaster recovery. "From the CIOs' side of the fence, they're under pressure on technical matters like delivery of systems. They have a challenge even staying up with the typical questions of disaster readiness under their own purview," like data backup and redundancy, says Porter.

But those CIOs who do take charge—or at least take part—in business continuity planning garner additional respect from the rest of the business team. On a good day they can also be the heroes, like Potomac Electric's Cohn. "Of all the officers, the CIO can make sure that the information is provided to the crisis management team, both in the assessment and response phases," says Bellcore's Kalmis. "But don't wait for an event to communicate. Start management talking today." As with any emergency, the time to prepare is now. CIO

Lauren Gibbons Paul is a freelance writer in Belmont, Mass. She can be reached at laurenpaul@sprintmail.com. *Additional research by Senior Editor Howard Baldwin.*



Team

Ashank Desai, *chairman of India's Mastek Ltd., credits global teaming for the growth of his company.*

Heat

Your global team may have conquered time and space, but for it to be successful, you'll have to look out for other obstacles

BY DEBBY YOUNG

REALLY, IT WAS A SIMPLE REQUEST. Just a cellular telephone, the kind you can't avoid on any sidewalk in America. Former Oracle Corp. CIO Jerry Corvino ordered one for an IT manager in mainland China as part of a global IT implementation across 57 satellite offices of the $7.1 billion database company. But the accounting department kicked back this particular request. The rationale: A pager would be less expensive—why couldn't she make do with that?

Reader ROI

WITH CORPORATIONS EXTENDING their activities across geographies, global teams have become the norm. Though technology breaks down barriers, a host of cultural challenges lurk. This article will tell you how to

- Avoid the common mistakes that doom global projects to failure
- Make global teams more productive

Corvino patiently explained that in the village where this employee lived, there was just one single wired telephone. Not one in her house—one in the entire village. Giving her a pager wouldn't do her much good if she couldn't get access to that one telephone, would it?

The moral of the story is this: Infrastructure is not the same around the world. Even something as ubiquitous as a telephone can present a challenge. And as more companies embark on global IT projects, CIOs are being asked to align technology not only across business units but also across geographies and cultures. Global teams are playing a pivotal role in guaranteeing the success of these enterprisewide initiatives. Their members are required to possess the multinational sensitivity, the cultural diversity and the shared vision to motivate local buy-in to the project—whether it's new infrastructure technology to facilitate communication between sites or new business processes to drive down operating costs or increase revenue.

Global teams, however—whether built wholly from internal resources or supplemented with outsourced services—are not without their difficulties. Time and distance tend to escalate problems. Technology has minimized some of these issues, but it still takes concerted effort to shift an organization from a local mind-set to a global one. And without that shift, global teams will find it almost impossible to work in concert to achieve their goals. (For a contrary viewpoint on the value of teams, see "It Doesn't Work for Everyone," Page 45.)

PHOTO BY RAKESH SAHA

The Most Common Pitfall: Cultural Imperialism

Cultural imperialism, the worldwide assumption that everyone thinks like you, is a major stumbling block to global teaming. It's not enough to acknowledge that cultural norms vary from country to country; you have to understand how they affect a project's dynamics. Culture colors perceptions, influences interactions and affects performance. What one culture perceives as strength, another may view as weakness.

Looking for ammunition against imperialism? Terry Neill, a managing partner at Andersen Consulting's London-based change management practice, swears by the research of Dutch professor Geert Hofstede, who mapped the individual measurements of national cultures. Hofstede's five dimensions are power distance, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance and future-orientation versus short-term perspective. "When you comprehend the cultural differences among those sitting around the table," says Neill, "you can anticipate where the areas of difficulty are likely to be."

Take the different ways cultures approach conflict. Based on his experiences with global companies such as Shell Oil Co., Unilever PLC, General Electric Co. and British Petroleum Co., Neill observes that the British, Irish, Americans and Dutch deal easily with open argument. On the other hand, the Japanese and many other Asian cultures, whose natural style is to be more reticent and polite, feel uneasy and even threatened if caught in the middle of a dispute. Americans and Europeans on the team need to understand how their directness makes Japanese teammates uncomfortable. Conversely, the Japanese need to understand how their reluctance to be specific about underlying issues frustrates their American and European counterparts.

"East Indians tend to be too polite," observes Mike Cast, managing director for Mastek UK Ltd., the British strategic business unit of Mastek Ltd., a software factory based in Bombay, India, that exports its programming services internationally and specializes in outsourcing work to India. Cast finds that Indian programmers are reluctant to warn clients that their ideas are unreasonable, even if those ideas will undoubtedly delay the project's completion. Cast's U.S. counterpart, Kenneth C. Behrendt, tells of teaching his Indian programmers how to deal with confrontation. "We worked hard to demonstrate that confrontation is good, that it creates a win-win situation," insists Behrendt, president and CEO of Majesco Software Inc. Once programmers saw how addressing conflict helped them make positive strides with the customer, it was easier for them to be more confrontational on the next project.

You don't even need to look overseas for misunderstandings. "There are as many cultural issues between New Yorkers, Texans and Californians as there are between different nations," maintains Keith Glennan, director of integration and engineering for U.S. defense contractor Northrop Grumman Corp. in Hawthorne, Calif. California-based Northrop merged with New York-based Grumman in 1994. In quick succession it acquired three companies: Texas-based Vought Aircraft Co., the Maryland-based defense and electronic systems division of Westinghouse Electric Corp. and Logicon Inc., a California-based provider of defense information technology systems and services. When the five-company global team began working on its first project, participants found that even their basic approaches to project planning differed. They disagreed on how much planning should go into the project, how rigorous it should be, even how much documentation they should provide.

It doesn't matter whether you

Northrop Grumman's **Keith Glennan** *believes that cultural differences exist between New Yorkers, Texans and Californians as well as between natives of different countries.*

PHOTO BY KENT HANSON

assemble the global team from participants across the country or around the world. "You need to deal with these issues openly and agree to new ground rules. Inevitably team members will have to deviate from their own cultural norms and values," advises Neill. For instance, some team members will have to learn to be less aggressive, others less circumspect. A facilitator well versed in cultural differences can be a real asset at the start of the project. As an impartial third party, he or she can help the team identify and cope with the significant differences among the ways its members deal with issues.

An outgrowth of global teaming is that it helps CIOs become globally oriented, an important asset in fostering global trade and gaining an edge in worldwide markets. "The CIO [of a multinational company] needs to have empathy for the local culture. Because when we understand each other, we make global trade that much more feasible," says Ashank Desai, chairman and managing director of Mastek Ltd.

Desai's hearty endorsement of global teaming stems from his company's own success with using global teams to expand export of its software services worldwide. Over the past five years, Mastek has grown 112 percent annually, extending its presence from the Asia-Pacific region through Europe and the United States. "That signifies that global teams are working. We could not have grown so fast if the trend wasn't in that direction," maintains Desai.

Another Common Error: Location-Centric Thinking

When team members are scattered throughout the world, you can't treat everyone as if they reside in the same time zone. Jaclyn Kostner, CEO of Bridge the Distance Inc., a Denver-based consulting and training firm specializing in enhancing human communication and trust in the virtual workplace, tells of one client whose team leader in Atlanta kicked off every week with a 7 a.m. meeting. When the company reorganized and added new people to the team, it never occurred to the team leader to reschedule—even though one member now resided in Sacramento and another two in Denver. Imagine trying to muster energy for a teleconference at 4 or 5 in the morning!

Kostner notes that she often finds global teams planning meetings on Friday morning in the United States despite the fact that it's already Saturday morning for team members in Australia. She suggests that there has to be compromise in the scheduling and location of meetings, conference calls or other forums for information exchange to allow team members an equal share of "local" comfort.

Leo Puga, the human resources manager of Hewlett-Packard Co.'s printer division in Boise, Idaho, also recommends allowing for some recovery time when scheduling a meeting where participants have to fly great distances. "You cannot send somebody from here to Japan and expect them to engage in any kind of meaningful discussion about business the minute they step off the plane. You need to give people a chance to recover," says Puga.

Another common mistake with location-centric thinking is believing you can sit in the United States and dictate policy elsewhere in the world. "It's never been successful," contends Jerry Corvino. "You need a strong leader [in the region] who can raise a red flag when you start down a path that's going to cause

It Doesn't Work for Everyone

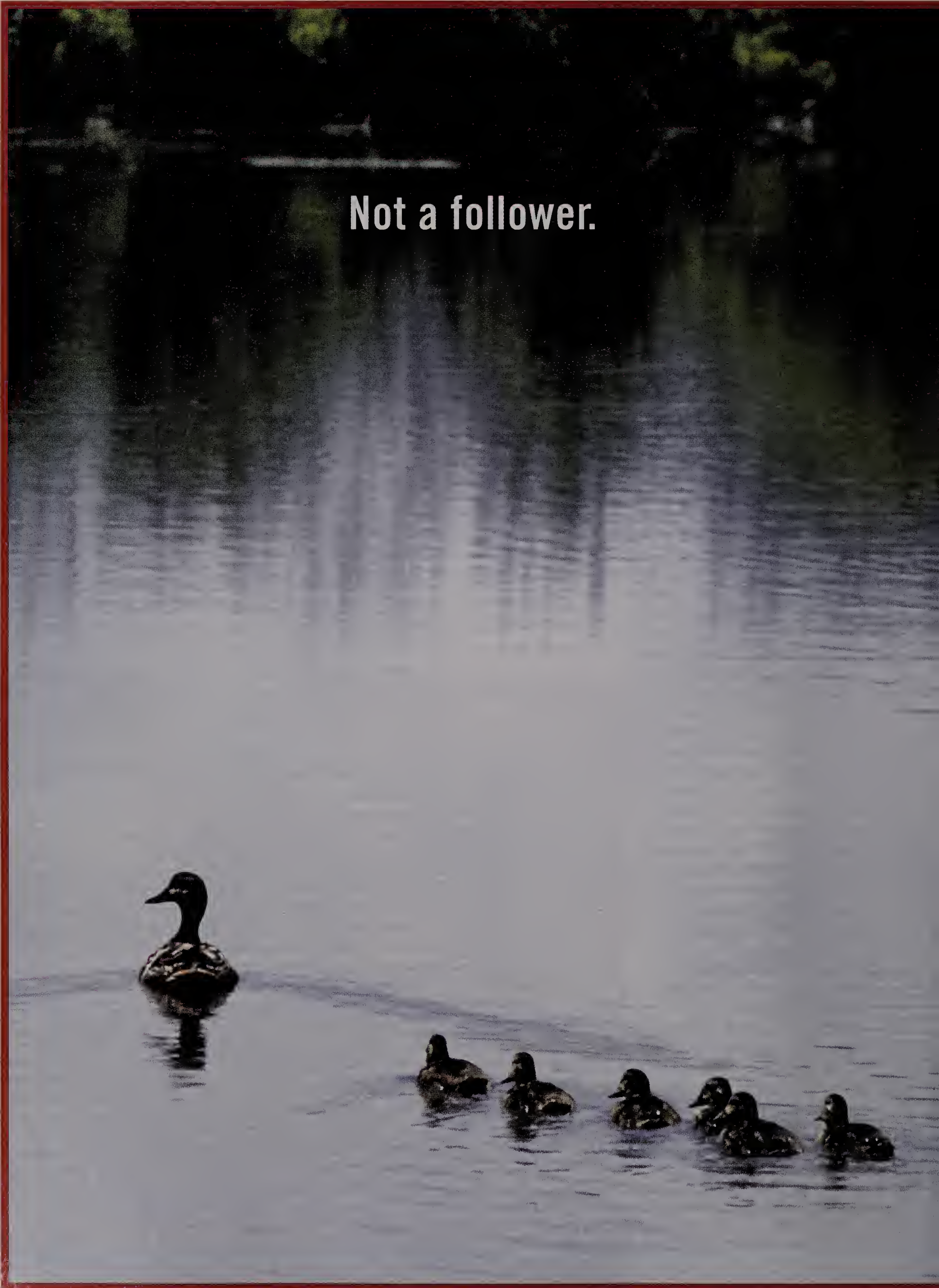
Sometimes global teams succumb to inertia

NOT EVERYONE EMBRACES THE IDEA OF GLOBAL TEAMS. DORON COHEN, former vice president of IS and telecommunications for TransCanada PipeLines Ltd., rejects the notion out of hand. His entire IT organization comprises teams that are physically located within the business units. The $12 billion, Calgary-based energy corporation has rebuilt all of its mission-critical systems, moving from mainframe to client/server, using local dedicated IT teams.

"They live the business issues [of the units] on a daily basis. That gives them the strength to get things done fast," says Cohen. He also believes that you have a much better chance of gaining the business unit's buy-in to a project when the business units see the IT team is an integral part of their operation, not as strangers from corporate telling them how to do their jobs.

He speaks from experience. In 1993, corporate TransCanada attempted a global initiative to implement common work processes in its marketing operations. The goal was to reduce transaction costs—a laudable objective. But people were not prepared for change. "Everyone was protecting turf, defending their comfort zones, finding 17 reasons why it didn't work for them, finding 14 reasons why they were different," recalls Cohen. The project lingered on for two years before Cohen "put a bullet to it."

Cohen suggests that any company that expects a global software system to be the impetus for changing business processes across the enterprise ought to think twice. IT can be a partner in the process, but not the driving force. For projects of that magnitude to succeed, process specialists and organizational development experts must ready the enterprise to embrace change. Then local IT teams can step in and translate that corporate vision into appropriate systems for individual business units. *–D. Young*



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problems that you wouldn't anticipate." The same project that had encountered telephone problems in mainland China fell behind schedule in South America as well because no one in the States had anticipated how long it would take to get a visa for a certain South American country. Corvino says that particularly in Europe—with the upcoming transition to Euro currency, deregulation of the telecommunications industry, new social legislation and changes in labor laws—you need people with local knowledge who understand the implications of those events and how they will impact implementation of global plans. For instance, labor laws are much stricter in Europe than in the United States. It's not easy to move European employees between countries or to change the scope of someone's job.

Most of our ability to understand each other comes from visual clues, notes Denver consultant **Jaclyn Kostner.**

PHOTO BY PATRICIA BARRY LEVY

Acknowledging Differences: Business Styles and Protocols

When you mix cultures, management styles often clash. Many consultants identify Americans with a "ready, fire, aim" approach to problem solving. "That's because we're really good at course correction and coming back around and saying we were wrong and doing it again," says Melvin E. Weems, a management consulting partner for PricewaterhouseCoopers who recently transferred from the United States to the firm's London offices. In contrast, Weems says, other cultures tend to tackle issues with a more cautious "ready, aim, aim, aim, aim, fire" approach.

You need to sensitize your global teams to the protocol differences among their participants. "When you're in Japan at a business meeting," says HP's Puga, "there's an appropriate protocol for meeting people and questioning issues. [Ignorance of that protocol] could have a very significant impact on the results of the meeting and how the results of the meeting are going to be interpreted." Puga recalls an instance when Americans inadvertently shamed Japanese team members by raising sensitive issues in an open meeting forum instead of bringing them to the attention of the appropriate Japanese manager privately. To prevent such offenses, Hewlett-Packard now offers to global team members two-day courses in Japanese culture and protocol.

Mike Rose, CIO of Hewlett-Packard, sees global IT initiatives as a delicate balance between assuring the autonomy of the business unit and providing an infrastructure able to drive global change. When he came on board in July 1997, he delegated control of the global data centers to three "super-regional" IT managers—one in Europe, one in Asia-Pacific and one in the Americas. "It was a great catalyst for teamwork," says Rose, "because each region had someone to turn to to address their specific local needs as well as help them participate in global process changes." The three regional IT managers and the business infrastructure services manager meet face to face every six weeks as a united infrastructure management team, with conference calls in between, to assist business units in coordinating global IT projects. Yet each

Don't Depend on Technology

Virtual meetings have their own trials and tribulations

DESPITE IMPROVEMENTS IN TECHNOLOGY, NOTHING REPLACES OLD-FASHIONED, FACE-TO-FACE contact. "Research shows that 55 percent of our ability to understand each other comes from visual cues. Another 25 percent comes from feelings cues—such as asking whether or not something makes sense," says Jaclyn Kostner, CEO of Bridge the Distance Inc., a Denver-based consulting and training firm. "Our telephone conversations rarely deal on that level. But if I can see a scowl on your face, I'm going to infer how you felt about something. So when we start communicating by voice alone in a virtual setting, without the face-to-face context, we're basically operating at about 20 percent effectiveness."

A videoconferencing system can supplement teleconferences, e-mail, electronic chat room discussions and other vehicles for information exchange. But these media have their drawbacks. What happens when a time-sensitive fax or e-mail fails to reach its destination? Can a series of exclamation points across a page convey the same sense of urgency as a panicked look? What happens when, due to technical difficulties, one party unexpectedly drops out of a videoconference in the middle of a sensitive debate? Consultants, CIOs and participants agree that global teams still need to meet face to face on a regular basis. Only then can they come to understand each other as individuals and put the various other communication they're receiving into context. *–D. Young*

The three IT managers that HP CIO **Mike Rose** *appointed in Europe, Asia and the Americas meet face to face every six weeks.*

PHOTO BY KENT HANSON

business unit maintains the autonomy to organize its IT community to suit its own goals and operating needs.

Communication styles also differ from culture to culture. Kostner recommends that global teams establish very clear norms about communication. While Americans like to cut to the chase, Germans prefer presenting the underlying rationale before getting to the action item. Kostner suggests that to work effectively global teams need to rally around a single norm—usually stating upfront whether the topic is an action item, who owns the action item and when it's due. This is followed by explanatory support material or further discussion.

Neill of Andersen Consulting also cites significant differences among various cultures in views about team leadership. He tells of a U.S. client that appointed a Dutchman as head of European operations. He wore a beard, dressed casually and drove a very old automobile. When he visited the German subsidiary, he found it very difficult to be taken seriously or listened to with respect. The Germans viewed his appearance, dress and mode of transportation as a reflection of his stature and treated him accordingly. Neill advises CIOs to be cognizant of these cultural biases when recruiting global teams and selecting leaders for enterprisewide initiatives.

Team Design Is as Critical as System Design

Designing an effective global team is never something to be taken lightly. It requires considerable resources and effort both from project sponsors and participants. Based on 18 years of experience helping corporations like Bristol-Myers Squib Co. and Baxter Healthcare Corp. use multicountry teams to implement global IT programs, PricewaterhouseCoopers' Weems has found that different countries may embrace, support and adopt a project in different ways. Weems therefore recommends incorporating diversity into the team on a number of levels: multinational, multioperational and multiple breadths of experience. "When you're tackling a project of this scale," he suggests, "you need people on the team who understand that sometimes you have to craft your message differently or you have to build consensus differently, depending on the country you're dealing with."

"Not only should you address and embrace cultural diversity," says HP's Rose, "but I would say you have to embrace the entire mosaic of affiliations." Caught up in the problems of language, culture and time zones, team members often fail to recognize the functional affiliations they share with each other. They might both be financial people, or HR people or telecommunications engineers. "If you understand the mosaic," says Rose, "you can actually use that to help bridge the other gaps like culture, language and distance."

"It's important to always focus on the business case for the project," says Tom Shelman, vice president and CIO of internal information services at

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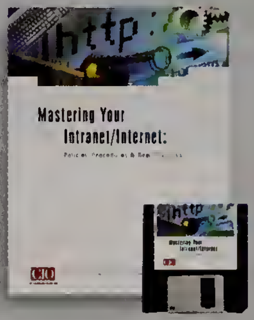

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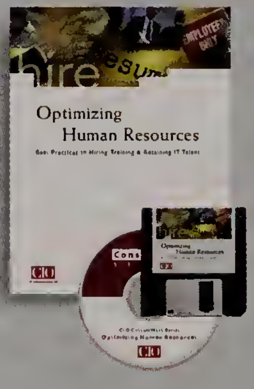

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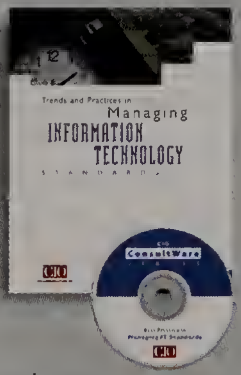

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Northrop Grumman. "Most people want the corporation to do well. If you can show them how the change will benefit their business unit and the corporation as a whole, you'll get buy-in to the project." Shelman strongly recommends enlisting the support of senior management in every business unit to help spread the message that long-term value ultimately far outweighs any short-term discomfort.

In one instance, the Germans refused to take the Dutchman seriously because of his beard, casual dress and old car.

"Don't fall into the trap of trying to make everything global," warns Corvino. Decide what's absolutely critical to running a global business and make those things mandatory. For everything else, you must let local needs drive local parameters.

Neill cautions that the values, beliefs and behaviors that each team member brings to the table are different. Their cultural context colors every interaction—whether it's views on leadership, approaches to risk and conflicts, or any other team activity. Lack of understanding can quickly turn a $200 million project into a $400 million one. Conversely, when you educate team members on how to interpret one another's behavior, the payoff from working well together can be enormous.

Neill insists that just as you have to recognize the differences between computer operating systems when building a network, so, too, do you need to acknowledge and accommodate the differences between individual team members. He advises CIOs to apply the same rigor to team building as they do to designing any IT project they undertake for the corporation. "Why," he asks, "do we think it's natural to invest millions of dollars to get computer systems to work together, yet we think it's unnatural to invest even a fraction of that cost in designing and educating teams on how to work together?"

Freelance writer Debby Young is based in Framingham, Mass. She can be reached via e-mail at dscribe@erols.com.

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ENTERPRISE ARCHITECTURE

Propelled by the need for consistency, the U.S. Air Force discovers that finesse is better than firepower

BY DAVID PEARSON

Fight or

Lt. Col. David Genovese's battle plan for an enterprise architecture was to treat it as an evolution, not as an event.

Flight

THE LAST THING LT. COL. DAVID GENOVESE THOUGHT HE'D HAVE TO INCLUDE IN the schematics for an enterprise architecture for the United States Air Force was a blueprint for buttering up the troops. Yet, halfway through a $1.2 billion, six-year installation of common network building, management and protection platforms across 108 air bases around the world, the 20-year airman and Desert Storm veteran admits that if he had the chance to start over, fomenting "downward buy-in" would rank among his top objectives. He would have earmarked more of the funds for communicating the mission and vision of the project; would have spent additional hours touring the bases, evangelizing unwilling and indifferent converts on the big-picture benefits that the new infrastructure promises. Such an attack, he now believes, would have cut the total time to complete the project by as much as half.

"Technically, I can compel anyone up to a lieutenant to do anything I deem essential—including, in certain cases, literally risk losing their lives," says Genovese. "But I've learned through this process that when it comes to IT at least, you don't get good results if you just tell people to do stuff. They may do it, but if you don't first make sure they believe in it, they'll do a rotten job of it."

Reader ROI

THE UNITED STATES AIR FORCE can make its people do whatever it wants them to do. So why is it taking great care to foster "downward buy-in" on a billion-dollar enterprise architecture? Because the project will fly faster and farther that way, says its master architect, a veteran officer for whom that's been no easy lesson. Learn from his headaches why gentle persuasion beats direct orders, how not to let daunting technical challenges overshadow basic management concerns and why, on enterprisewide IT projects, communication is as important as control.

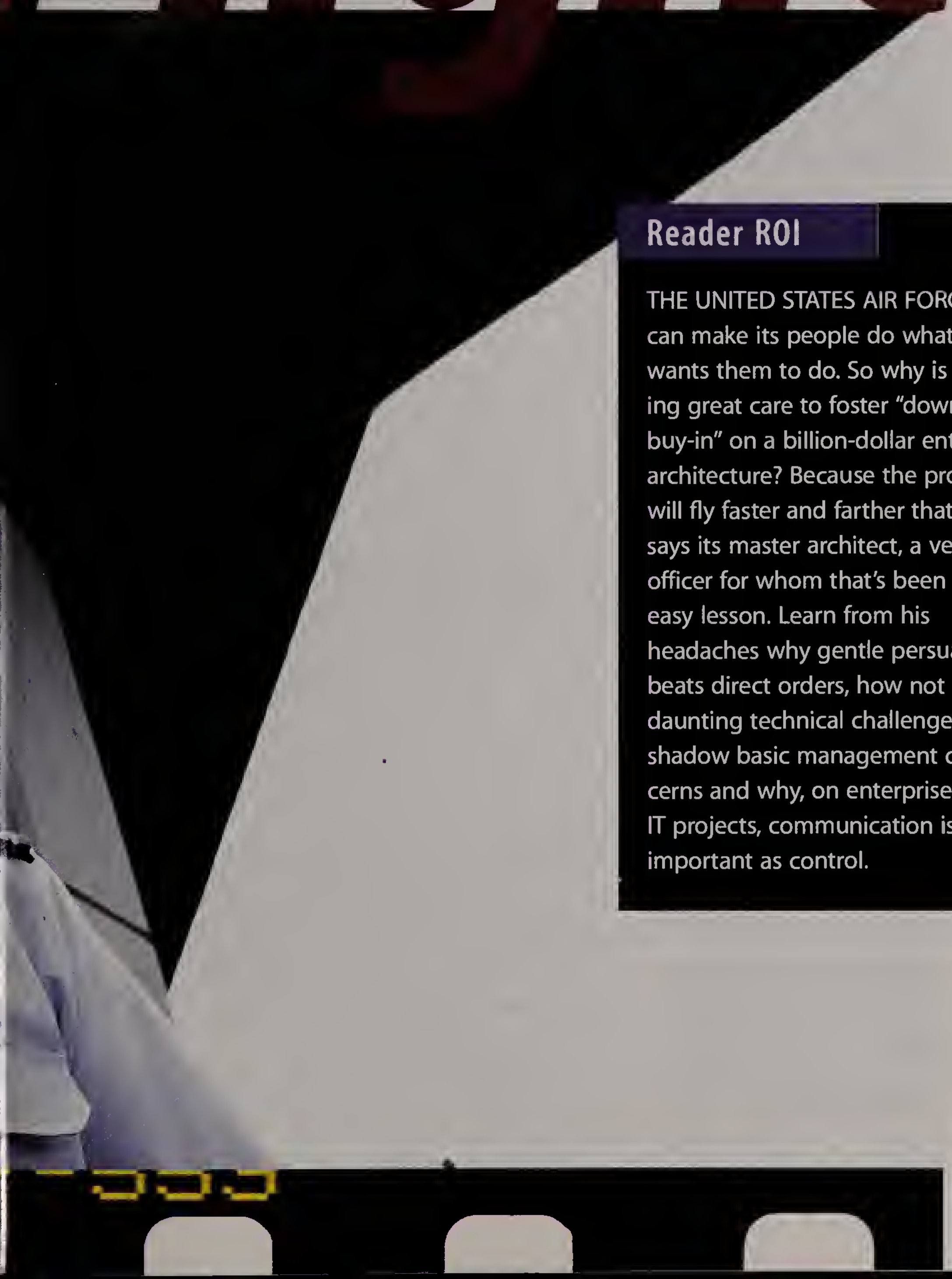


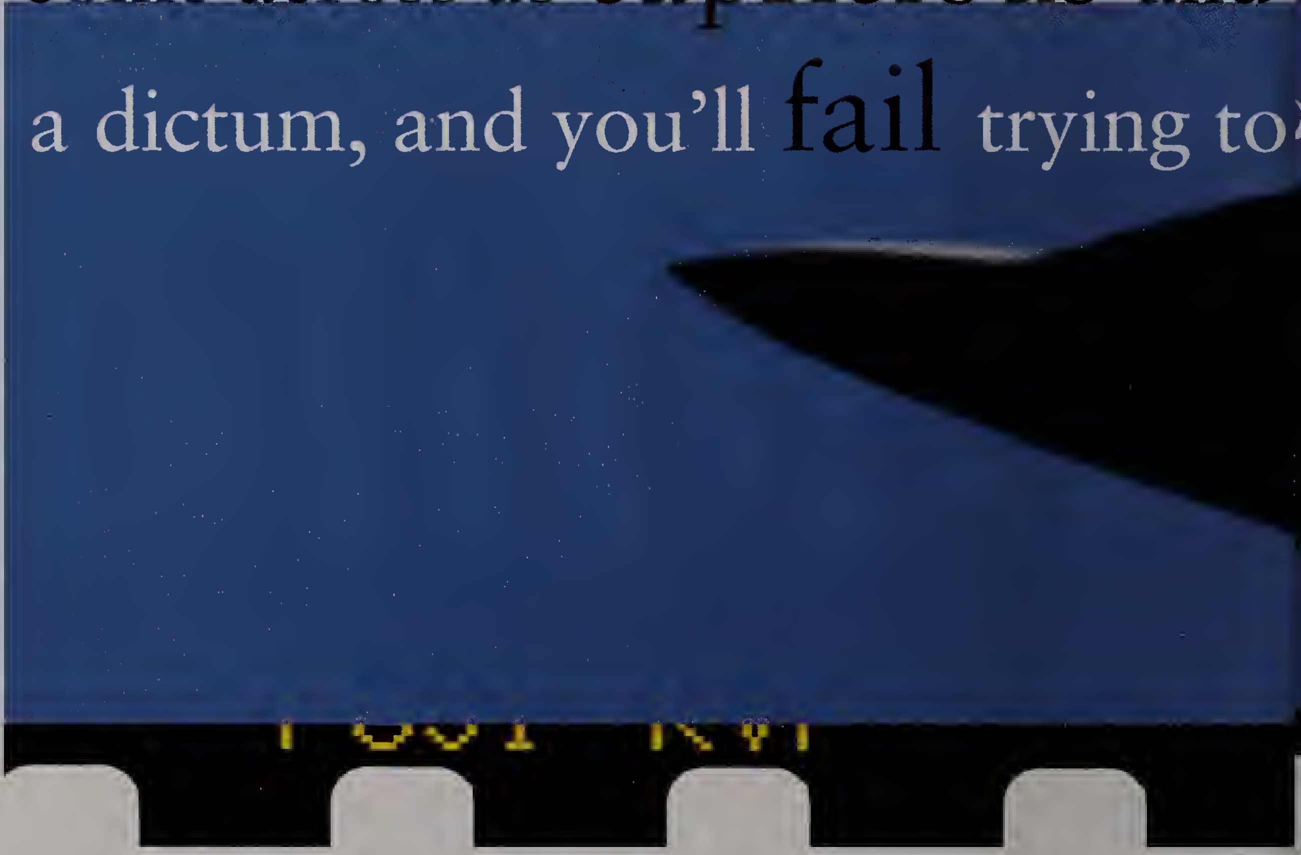
PHOTO BY MARK WILSON

Not exactly a lesson you'd expect to learn from the military.

And maybe it's a basic drill—what CIO doesn't know by now that domestic diplomacy is more effective than dictatorship when it comes to effecting large-scale change across the enterprise? But the Air Force's experience is particularly ironic, given the military's culture of orders and obedience—and thus should stand as an example to any IT executive who would use his or her authority to lay down the law first and ask questions later.

“You can't come across as capricious and

Lay out a dictum, and you'll fail trying to



Cruising for Control

Genovese, who rose to executive director of the USAF's worldwide integrated networks after proving his IT and leadership mettle in a wide range of technical and strategic positions, shared his thoughts on the project—known in the Air Force as CITS, for Combat Information Transport System—a few days before he retired from the service to join a commercial network management consulting firm.

When completed in 2002, CITS will be the Air Force's sole source of voice, video and data transmissions for everything from payroll processing to satellite feeds from remote, unmanned vehicles behind combat lines in such places as Bosnia. “Networks will be some of our most powerful weapons” in 21st century arsenals, says Genovese.

The Air Force recognized years ago that effective information systems were key not only for day-to-day operations but also for combat strategy. But its approach to IT management had been decidedly fractured—a reflection of the branch's emphasis on decentralized decision making.

“We're a collection of autonomous business units,” says Genovese. “In battle, that's a plus. You want to foster a certain level of independence, especially among squadrons and other small groups. But lots of times the individual units don't have a full appreciation of how their efforts fit into the big picture.” Myriad disparate networks, architectures and legacy systems of every sort had proliferated across the branch. Plus the Air Force has drastically downsized over the past decade, increasing the demand for automation.

On top of all that have come several developments that, combined, sounded the wake-up call for a single, unifying fixed infrastructure. First was an exponential increase in data traffic, spawned by a proliferation of client/server systems throughout the Air Force. Second was the movement throughout the commercial sector to reengineer business processes. And third was a couple of alarming infiltrations of classified Air Force systems by outside hackers.

CITS will provide fiber-optic links at the 108 bases, which until now have maintained old, undersized copper cable plants and switching systems “unfit for the theater battle management” systems of the future, says Genovese. “We're delivering big bandwidth,” he adds. An example of the improved capabilities to derive therefrom: Real-time video feeds will reach colonels and generals in their tents on the front line, and the White House will be able to watch the feeds at the same time.

Network management will be performed on base network control centers by systems managers, who will also be able to monitor network and switched traffic, provide training and trouble-shoot problems. And network protection will be provided by real-time protection tools such as firewalls with software sets that will enable the systems managers to continually assess vulnerabilities and intercept unauthorized network infiltrators.

The Defense Department's IS network provides the wide area connectivity for all branches of the service; CITS, using routers, switches and hubs, sits on that as a kind of campus infrastructure, and individual bases' existing LANs and servers form a deeper layer.

The project got underway officially in 1996, and all 108 bases are currently at some level of activity on each of the three phases.

A key financial return on the CITS investment will be a reduction in military and civilian IT staff on the bases by up to 40 percent, made possible by remote network management.

Genovese says a significant technical challenge has come in configuring firewalls, particularly as server locations change from one location to another. Staffing is another major management concern, as much of the installation and service work is done by internal resources who frequently take their experience to the more lucrative commercial sector at the first opportunity.

Formidable as such challenges are, says Genovese, they aren't the source of the most maddening moments he's had to manage over the past three years.

"Once you've got the money in hand, digging up roads [to install cable], fine-tuning hardware and software, and working out bugs is relatively easy," he says. But "every base has its own personality and its own way of doing things. You're tearing that down when you make them part of an enterprise. And it really is somewhat confrontational to go in and do that."

Asked if the tension had hastened his retirement, he chortles. "Three years of it has worn me out."

Renegades Run Amok

How bad does the culture clash get? Last year a command on one of the largest air bases waited for its new firewalls to be installed, then quietly dismantled them. Seems they liked the old ones—the ones they'd selected for themselves—better. The new equipment was relegated to a mail server, says Genovese. Another time, right on Genovese's home base, Hanscom AFB in Bedford, Mass., a local communication squadron tried to trade in the enterprise-approved HP NT system for a Unix one. Genovese spares the details but allows that things got ugly and "there were some spears thrown both ways."

In both cases, the dissenters tried stepping up the rungs of the hierarchy, appealing to higher-ranking officials in search of political firepower—evidently unaware that the CITS project had the might of the Pentagon behind it. Once that little detail was clarified, the renegades relinquished control of their respective stovepipe systems.

Two basic problems lie at the root of the boldness in defying authority: decentralization and IT's historic role within the military. "In the combat operations business, we're really able to bring compelling decisions to bear," says Genovese. "People don't monkey with an F22 or decide they like a Collins radio instead of a Motorola. The guys and gals that fly the planes know their job is to fly, not to engineer equipment. But in the IT community, that's not the case. People have had the flexibility to look at different products and decide what they like."

Each base is run by a four-star general who functions as a CEO of that operation, and most have one individual who holds the CIO title. Some of the bases are large enough that they have their own enterprise architecture projects underway along with the centralized, Air Force-wide infrastructure that Genovese has been working on. And they're busy enough with their own architecture projects that they're unaware of the latter.

For example, the Air Force's Air Mobility Command, out of Scott Air Force Base in Belleville, Ill., has a comprehensive enterprise architecture project underway. It's got its own planning, investment and acquisition strategies, and a 20-year migration strategy. Yet its chief architect has never heard of David Genovese or CITS. "We certainly use the infrastructure to support our applications," says Jim Donovan, a civilian who's employed by The Mitre Corp., a federally funded research and development center that manages a number of DoD projects. "But it sounds like they're focused on constructing the network, and we're focused on supporting the specific business needs of this particular command. There's a lot of people doing architecture in the Air Force. I don't have any doubt in my mind that all the pieces will fit together in the end."

Genovese says most of those who need to be clued in to the CITS initiative are on board. The Air Force's largest single command, Air Combat, out of Langley Air Force Base in Hampton, Va., is a major CITS booster. "Military decision makers depend on operational availability of all capabilities," says Col. Dale W. Meyerrose, director of communications and information for Air Combat Command, "and access to whatever database or information flow they need."

Meyerrose, incidentally, agrees with Genovese that the gentle art of persuasion

arbitrary.

carry it out."—COL. DALE MEYERROSE

PHOTO BY WALTER CALAHAN

gets better results than pulling rank. “Once you’ve got the support of your four-star in the form of a military order, it comes down to execution. You can’t come across as capricious and arbitrary. Lay out a dictum, and you’ll fail trying to carry it out.”

Dueling for Dollars

Meyerrose adds that a pesky drag on CITS is its perception even among those who do understand its importance and value. “There is nothing sexy about infrastructure,” he says. As a result, there has been some foot dragging on implementation—and 10 or so attempts to divert some CITS dollars to glitzier projects at Langley. His response in each case has been swift and firm: No way.

“As someone with a vested interest, and as an officer who understands the value of this infrastructure, I continually wish I weren’t challenged so much,” he says. “But I do understand it, and I think that the best results usually shake out of the competition for dollars. You sacrifice some efficiency and spend more than you need to get things done, but it makes for a good prioritization system and a good way to explain and reinforce high-level decisions.”

Genovese has these words of management advice for any IT executive who would migrate entrenched stovepipe systems into a set of fixed standards across the enterprise: “Don’t spring an architecture on the enterprise. Evolve into it,” he says. “It’s not an event; it’s a path.”

And, he adds, once you’ve committed to move ahead, you need to proceed briskly because the slower the migration, the greater the opportunities for dissent. Not to mention disorder: Thanks to the Air Force presenting so many tempting targets to so many IT vendors on so many different fronts, Genovese struggled to maintain a united front against the onslaught. “I tried calling all the vendors in and reading them the riot act,” he says. “Some listened and some didn’t, but, on the whole, it didn’t work.” He still got lots of e-mail from officers and staff who’d been wined and dined demanding to know why they couldn’t install this or that. “It seems the only mitigating approach is to do what you’re going to do fast,” he says. “The longer it drags on, the more divergence and chaos you invite.”

Having brought his longtime employer to the halfway point on an IT initiative that will affect every user throughout the enterprise—the first branchwide project to do that—Genovese looks forward to checking back in five years as a concerned citizen. “As far as we’ve come, many of the bases are still not fully either aware or in agreement that they are compelled to comply,” he says. “They still have their own staffs. They still have their own budgets. That’s what the Air Force doesn’t want anymore.”

And what the U.S. Air Force has learned to gently coax its soldiers out of. “You can’t just plant stuff and walk away,” concludes Genovese. “You really do need to communicate. Cheerlead, preach, publish, hold special events, do whatever it takes to galvanize not only acceptance but enthusiasm. Demonstrate that, in the end, the enterprise solution will benefit the entire enterprise beyond what even the best collection of individual systems and solutions ever could. Never stop repeating that message.”

Senior Writer David Pearson can be reached at dpearson@cio.com.

Building Strong Architecture Three Ways

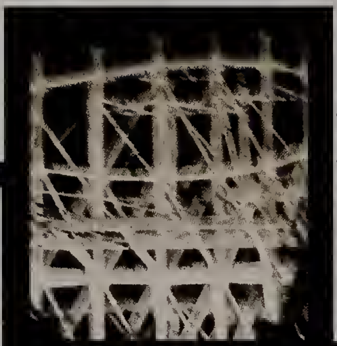
DOWNWARD BUY-IN ISN’T THE ONLY NONTECHNICAL MANAGEMENT CHALLENGE facing IT executives engaged in enterprise-architecture planning. According to Larry R. DeBoever, senior vice president of the Meta Group in charge of enterprise-architecture strategy, there are three basic principles to which every such project must hew if it is to fulfill its promise to enable rapid change in the business.

① **Successful enterprise architectures stimulate changes in behavior.** In most unsuccessful enterprise architectures, the point of failure is an inability to change the ways end users and IT staff leverage the tools available to them. “The best engineering in the world is irrelevant if nobody understands what they’re supposed to do differently,” DeBoever says. “A mediocre enterprise architecture consistently implemented is vastly superior to the best engineering in the world that nobody follows.”

② **Senior line managers must understand how the enterprise architecture enables the business.** “It’s amazing the numbers of people doing architecture who can’t explain the business fundamentals of it,” says DeBoever. “In almost every case, they have line managers going off and doing whatever the hell they want.”

③ **Successful architectures link the highest-level business drivers to the lowest-level engineering specifications.** Imagine a home designed by an architect whose bias for natural light sources results in illogical and out-of-the-way entry points. “An awful lot of enterprise architecture teams leap from, ‘This is where the business needs to go’ to ‘We need Oracle 7.2.’ And they can’t demonstrate how one relates to the other. If you can’t demonstrate it, chances are it doesn’t exist,” says DeBoever.

“There’s a lot of confusion around enterprise architecture right now because it’s a new discipline,” adds DeBoever. “It requires IT executives to analyze their business, make trade-offs across the technology and articulate what it means to every person with a stake in the business.” *–D. Pearson*



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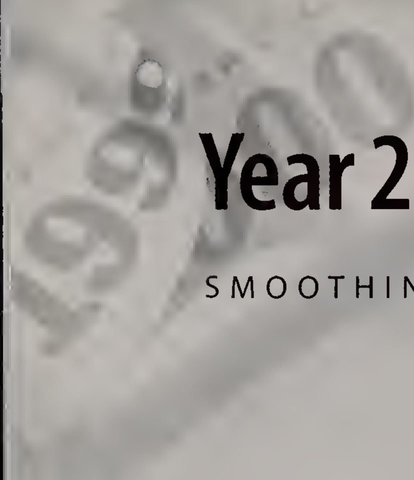

Year 2000 Challenge *Edited by Howard Baldwin*

SMOOTHING THE CONVERSION TO THE 21ST CENTURY

Checking the Chips

Finding Y2K bugs presents unique challenges when they're etched into silicon

BY SCOTT KIRSNER

CUE THE THEME FROM *MISSION: Impossible.* GartnerGroup Inc. in Stamford, Conn., estimates that by 2000, there will be 25 billion microprocessors deployed throughout the world. Fifty million of those chips will exhibit date anomalies when calendars flip from 1999 to 2000.

The challenge is figuring out which of those 50 million erratic chips are yours. Will it be the one that keeps your PBX telephone network running? The one that controls the fire detection system in your warehouse? The one that enables you to pump oil from the ocean floor, robotically weld together automobile components or circulate water to cool a power plant?

"Anything with microprocessors in it is potentially susceptible," says Rick D. Hale, the year 2000 program director at Amoco Corp. in Chicago. "Even if a small percentage of these devices fail, it could have a dramatic impact on your business."

Tracking down every flawed bit of silicon across the enterprise requires a rigorous, thorough search. According to Joseph Buffa of General Motors Corp. in Detroit, Mich., complacency was the enemy as his troops combed through lots of areas that seemed to have no problems. General Motors (GM) examined about 500,000 digitally controlled items for Y2K problems but found only a tiny percentage that exhibited symptoms of the millennium bug. "You're chasing a very small percentage of problems, and that requires tremendous discipline," says Buffa, GM's Y2K program director for manufacturing. Most companies find problems in just 15 to 20 percent of embedded devices, according to Giga Information Group Inc., a research firm in Cambridge, Mass.

Most organizations were late to recognize the threat posed by embedded processors. At Amoco, for example, the effort to fix mainframe-based computing systems began in early 1996; the search for embedded processor problems started more than a year later, in mid-1997. That leaves little time to complete a search-and-destroy mission.

Who's leading the charge to hunt out embedded processors? Surprisingly, it's CIOs and other IT-side executives. You may not want more on your plate, and while factory floor machinery and process control systems don't typically fall under your aegis, it's your people who have been attending Y2K conferences and gaining experience in Y2K project management. By partnering with the managers, engineers and technicians who best understand the equipment that contains embedded processors, IT executives can forge a powerful team to reduce the risk of serious failures.

Similar but Different

Addressing the embedded systems issue is similar in methodology to the way most companies have approached their legacy systems. The project starts with an inventory of systems that could be affected and continues with an assessment of which systems are dependent on dates, whether they could fail and how critical they are to

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the enterprise. Remediation and testing wrap up the project.

But there are substantial differences in the nature of the problems. Many embedded systems are effectively "black boxes," purchased ready-made from a vendor without knowledge of the components or code that makes them work. "If we have a black box system controlling our HVAC system, no one within Amoco is likely to be intimately familiar with the contents of that box," says Hale. "As a result, you're very dependent on the supplier of that product for information that would inform you whether or not you have a Y2K problem."

Another vendor acknowledged that a $119,000 piece of laboratory imaging equipment was not compliant, but offered to sell a compliant system for a bargain price of $110,000.

Since so few companies have completely eradicated their embedded systems issues, there are few existing benchmarks about the cost and duration of such projects, according to Barry Kallander, vice president and general manager of business solutions at Litton Enterprise Solutions Inc. in McLean, Va., who is focused on helping utilities deal with these issues. Testing is also particularly difficult, since companies must shut down entire plants or production lines. "The cost of bringing a nuclear plant down can be $1 million a day," says Kallander. "That adds to your project costs very quickly."

Finally, embedded chips in ships, aircraft, nuclear generators and hospital equipment have the potential to cause far more damage than a bad line of code in an accounting application. "Quite literally, people's lives are on the line," says John Dana Smith, CIO at the Arkansas Children's Hospital in Little Rock. "If a ventilator stops at midnight, there's no workaround, and you don't have much time to respond. This is serious business to us."

Taking Inventory

Most CIOs can locate every mainframe in their organization without much trouble. It's a much tougher task when you're talking about locating every chip in a far-flung enterprise. Kallander at Litton recommends starting with a data search of all available documentation and maintenance records. "Look for things like controller, digital, recorder, transmitter or display device," he advises, and pinpoint them for evaluation.

Then, convene with experts who know your factory floor, facilities management or process control systems. "Give them a few hours of training in the Y2K problem and your methodology," Kallander says. "Start making lists of what could be affected, and follow that with walkthroughs to see if you've covered everything." Comparing those lists among divisions, or with those of other companies in your industry, can help identify items you might have missed. Some companies opt to bring in consultants that have done embedded systems work in similar fields to be sure they've caught everything.

If that sounds time-consuming, it can be. Large companies that haven't yet begun the embedded systems portion of their Y2K project may want to take a different approach, says Stephanie Moore, a senior analyst at Giga. "The bottom-up approach is to do a full sweep of your entire operation and inventory everything that might have a chip in it," says Moore. "With time running short, though, companies may want to take a top-down approach: Identify what your mission-critical systems are and fix them. It doesn't make sense at this point to be counting all the coffee makers and fax machines."

Working with Vendors

Once you've identified what devices contain chips that could adversely impact your business if they malfunction, it's time to determine whether they're Y2K compliant and, if not, how you can make them so. Since it's difficult, if not impossible, to get at the code running on microprocessors, or to fathom how the components of a black box system interact, this step requires close collaboration with vendors. While many vendors are posting information about the Y2K status of certain products on their Web sites, the consensus is that this information isn't sufficient to ensure that a system won't fail. Too many variables are at play, like how the systems are configured and how they have been maintained and upgraded.

Smith at Arkansas Children's Hospital took his 7,000-plus item inventory and classified each processor-dependent device into one of four categories: unknown compliance, vendor-stated noncompliance, vendor-stated compliance and known compliance. "With the first three categories, either we didn't know enough about a device or we were taking someone's word that it was compliant or would be soon," Smith says. "If litigation came up, we figured we'd be liable for not confirming that the equipment would work. So ultimately, we wanted everything to be in the fourth category: known compliance."

Smith's experience working with vendors is representative of what others are likely to encounter. Some vendors were not only willing to confirm that a piece of equipment was compliant but offered to explain their testing methodology—the ideal situation. Some equipment, like the hospital's patient monitors, can be made compliant by purchasing a $150 replacement board. The manufacturer of the hospital's CAT scan and MRI equipment said that fixes may not be available until as late as September 1999, which makes Smith understandably nervous. And yet another vendor, which had sold the hospital a $119,000 piece of laboratory imaging equipment, acknowledged that the system was not compliant. Smith was offered a compliant system for a bargain price of $110,000, if he'd buy it within the next 60 days. "Some people are taking advantage of the opportunity," Smith says ruefully.

General Motors provided vendors with its own detailed testing procedures and demanded results, but not many other companies can take the same approach. A different strategy is to emphasize common goals. "This is a problem we both have to fix," says Hale at Amoco, addressing an imaginary vendor. "I'm a valued customer, you're a valued supplier, and it's in both of our best interests to work together and share information."

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Remediation Options

Fixing Y2K bugs burnt into a chip is far more challenging than opening up a Cobol program and expanding the date fields. Typically, chips and entire devices must be replaced or upgrade boards need to be plugged in. That's not always a simple process. "Circuit boards aren't easily accessible," says Peter O'Farrell, a senior consultant with the Cutter Consortium, a research and consulting firm in Arlington, Mass. "You may have to completely dismantle the system to get at the circuit board. Then you can pull the chip off the board. But what if there's no new chip with the same footprint? Plus, you have all the static electricity issues, contamination issues and waterproofing issues. Messing around with boards is not much fun."

Especially if they're located at the bottom of the North Sea. Ascent Logic Corp., a risk management technology firm in San Jose, Calif., has inspected Y2K projects at several oil companies with embedded chips on the sea floor that control wellheads. "Most of those chips will shut down on Jan. 1, 2000," says Ascent President and CEO Larry McArthur. "The question now is, Is there enough diving capacity and time remaining to get a significant portion of these replaced?"

Be sure to order replacement parts and related services as soon as possible. "For every industry I've looked at, the order queues are filling up," says Roleigh Martin, a software engineer consultant in Edina, Minn.

Testing Conundrum

Testing fully remediated embedded systems presents some vexing challenges. "With a mainframe, you can create an isolated test environment that looks just like your production environment," observes David Hall, senior consultant for embedded systems at Cara Corp., a systems integrator in Oak Brook, Ill. "Where do you get a spare auto factory or power plant just for testing?"

The answer is, you don't. While some components and systems can be tested individually in a "benchtop" situation, most companies are forced to use their production environments for testing during scheduled downtime.

"Testing in isolation will get you in trouble," says George Surdu, the global Y2K program manager at Ford Motor Co. in Dearborn, Mich., which has found date problems in only about 2 percent of its processor-dependent devices. "We look at entire production lines, and validate and test the whole line."

Embedded systems concerns have come as an unexpected addition to Y2K projects for most companies. That results in unexpected increases in budgets. CIOs and IT executives need to explain the need for investigating their chip-related risks to top management in much the same way they introduced the mainframe problem. "Our management has been very understanding," says Brad Pence, manager of nuclear process computing services and Y2K manager at the Omaha Public Power District's Fort Calhoun nuclear plant in Omaha, Neb. "They haven't given us carte blanche, but every time I've come to them with a justification and said we need to expand the budget, they've said, 'Go for it.'"

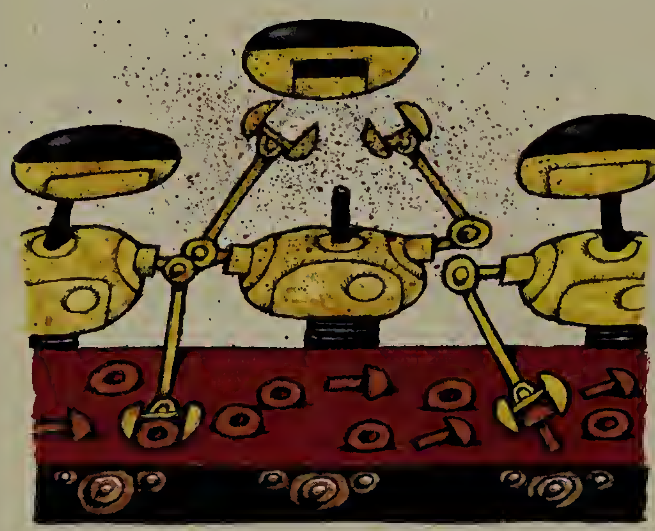
"This isn't a very palatable thing for management to address," says Hale at Amoco, "but this is no different from discovering a thinning [deteriorating] pipe at a refinery. It may not have been in your budget, but you have to replace it. Like the rest of the Y2K project, this is an unavoidable cost of continuing business."

Scott Kirsner, a Boston-based writer, is working on a series of articles for CIO *on the Y2K problem. He can be reached at* kirsner@worldnet.att.net.

Digging into Databases

WHEN IT COMES TO EXPLORING THE Y2K STATUS OF PROCESSOR-DEPENDENT devices, many companies are turning to databases compiled by private entities and industry groups. In theory, all it takes is a quick query to determine whether Robot X is going to survive into the new millennium.

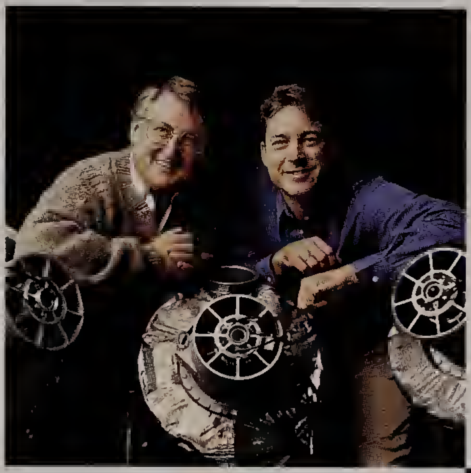
Consultants and systems integrators like Litton Enterprise Solutions Inc. and Tava Technologies Inc. see big money in building their own proprietary databases. Denver-based Tava, for example, has researched the Y2K status of more than 30,000 components. Gaining access to the Tava database costs at least $12,000, with an additional per-inquiry fee of $200.



Industry groups like the American Petroleum Institute, the Automobile Industry Action Group and the Electric Power Research Institute have also been developing Y2K databases of their own for use by their members. These collections are more targeted to the types of equipment used in a specific industry.

But experts caution that databases are most useful for double-checking your own inventory and test results. "Looking at what other people have found is useful," says David Hall, senior consultant for embedded systems at Cara Corp., a systems integrator in Oak Brook, Ill. "But it's not sufficient. You have to go to the vendor and check with them, do tests. I wouldn't recommend putting a check mark next to a critical item just because a colleague at another company uses the same product and found it compliant."

–*S. Kirsner*



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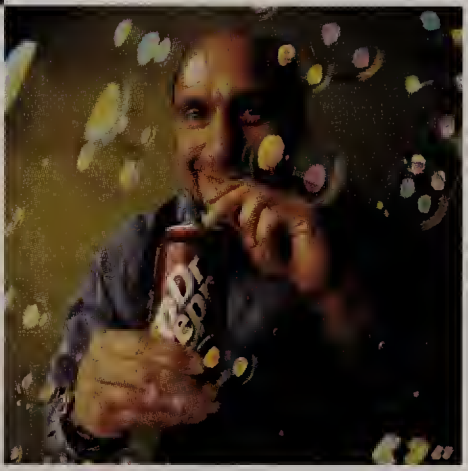

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Emerging Technology

THE STATE OF THE ART,
NEW PRODUCTS
AND STAYING AHEAD
OF THE CURVE

Edited by Howard Baldwin

Java in the Enterprise

To heck with the Web—IS is discovering Java's a treasure for internal development projects

BY JOHN WEBSTER

WHEN PHILIPS SEMICONDUCTORS INC.'S Neil Bostock set out to revamp the company's aging inventory accounting systems, his wish list included low maintenance costs and cross-platform portability. Any IT staffer desires these features for mission-critical applications, but Bostock, business unit controller at Philips' Sunnyvale, Calif., office, also wanted to take advantage of the company's intranet to let users in geographically far-flung facilities access the application. To ensure that he checked off every item on his list, he decided to develop the new pricing application not in C++ or a fourth-generation language but in Java.

Bostock's decision typifies a shift in IT managers' thinking on this new language. Initially, Sun Microsystems Inc. positioned Java as a way to develop small applications that people could download over the Internet. Now, an increasing number of companies are using Java to develop and deploy large mission-critical applications over their intranets. Software developers are offering Java-based tools for both application development and database access. Why? Because Java speeds up development and makes applications both flexible and easy to update. These are crucial attributes when a company must be nimble in order to remain competitive.

Industry observers trace Java's Internet strengths and flexibility not only to its object-oriented nature, but to the fact that its class libraries are designed specifically to expect the presence of a network (as opposed to requiring built-in communication capabilities). "Sun did the right thing at the right time with Java. Its Internet-ready class libraries, called JavaBeans components, make Internet-based application development easier than it is with C++ or other languages. And because Java uses familiar C++ syntax, it's easy for C++ programmers to learn," says Paul Harmon, editor of *Component Development Strategies*, a monthly newsletter available from the Cutter Information Corp.

IN THIS SECTION

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Y2K Videos
Intranet Management

Bostock also wanted the portability that comes with Java-based applications deployed over an intranet. "The pricing systems were 15 years old, and written in Cobol, and we have very few people left that understand it," says Bostock. "We're replacing [the system] with a Java-based client/server system primarily for portability reasons. We wanted to make sure that users could access the inventory database from their browsers regardless of the operating environment and platforms they have in place and no matter where they are located around the world."

To create the new pricing application, Bostock turned to Oakland, Calif.-based Vision Software Inc.'s Jade software, a Java-based application code generator. Philips hired KPMG Peat Marwick LLP to implement the new application, and Bostock found that not only could they develop the Java application very fast, thanks to Jade's

ILLUSTRATION BY RAY VELLA

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rapid code-generation capabilities, but they could also deploy the large application quickly due to Java's Internet-readiness. "For Philips, we produced about 100,000 lines of generated code that compiled and ran without errors and has reasonably good performance," says Stan Hendryx, senior manager at KPMG in Mountain View, Calif. It took three programmers 10 months to create Philips' new pricing application; in comparison, for a different client, it took a dozen programmers using Sybase's PowerBuilder18 months to build an application with 50 percent more forms. What's more, he got the benefits of a browser-based client that needed no maintenance.

Easy to Set Up

Other companies are exploiting Java-based tools to access information in existing databases. Jeff Brobst, director of finance at Symantec Corp. in Cupertino, Calif., used Alphablox's Enlighten to create database queries that can be run from the browser. With Enlighten, Brobst developed a product tracking and revenue system that Symantec employees use to study product shipment data, inventory shelf life and detailed customer statistics.

"Putting the application on our intranet means there are no deployment costs incurred and we let users get the latest data worldwide. All our financial reports and product information are in Oracle databases, and we use Java's own database connectivity tools to let users access that data," says Brobst. "We introduced a browser-based, client-side Java front end in part because the old Microsoft Visual Basic front end, which accountants loved to use for all work with tabular data, didn't appeal to company executives, who are more inclined to use graphics." Brobst adds that the Enlighten development tool lets him represent data visually, without the maintenance required by Visual Basic or Microsoft Excel applications. When users launch the product-tracking application, they see a graphical chart that lets them get more detailed information by clicking on any element within the chart. If they choose, they can also switch the chart to tabular data.

Brobst says that the cost of deploying a graphical application using Visual

Windows Overlooking the Factory

Linking the shop floor and the top floor

IF YOU'RE THE CIO OF A manufacturing company, you've probably stared out at all that capital-intensive equipment and thought about how nice it would be to configure it as easily as you would a network of PCs. That is the bay into which the supply chain river drains after all, but linking the data that drives the machines and the data that drives, say, your ERP application has never been that easy to do.

MANUFACTURING

Manufacturing today is where standalone PCs once were in an isolated and semiproprietary state, says Bob Merry, president and CEO of USData Corp., a supplier of software for developing real-time manufacturing applications based in Richardson, Texas. Now, to improve supply chain management, open systems are invading the factory floor and USData is trying to lead the charge with a new product called Xfactory.

Xfactory is part of a product category that's been around for about 15 years called manufacturing execution system (MES), designed to integrate data from the factory floor with company databases. The problem is that if a manufacturer wants to make a change to the system, each station in the production sequence needs to be updated. "It's not unusual for a company to wait for a major shutdown or something that's going to bring the plant down, like a model change, to update the system," explains Merry.

What USData has done is start from scratch with MES and build Xfactory strictly with Microsoft technologies: ActiveX components run on the factory-floor devices, which connect to a Windows NT-based Microsoft Transaction Server, which connects with a SQL Server database (or any other ODBC-compliant relational database). As with any three-tier Web-based application, taking the business rules off the clients (in this case, the factory-floor devices) and putting them on a server makes them easier to update.

There are some drawbacks to USData's plan, to be sure. You have to upgrade factory-floor devices to comply with the industry's emerging OPC (OLE for process control) standard. Nor is it the only open game in town. According to Bill Swanton, Group Director for Manufacturing Strategies at Boston-based AMR Research Inc., USData is joining companies like Camstar Systems Inc., RWT Inc. and Wonderware Corp. in the NT-based MES arena. Xfactory is "one of the more visually appealing, intuitive and flexible applications" he's seen, but he gives USData more points for coming out with a product just as the viability of its standards are becoming clear to the market.

And that's a problem with standards-based products: Competitors come quickly. "Anyone who follows Microsoft will end up with something like this in a few months," says Swanton. "USData needs to exploit [its lead] while it can." That may be bad news for USData, but good news for CIOs.

–Howard Baldwin

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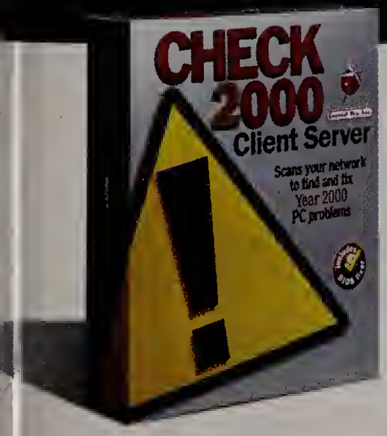

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Emerging Technology

Basic and SQL would have been much more expensive, though he would not estimate comparative costs, and that Enlighten pays for itself through reduced deployment costs alone. "Although actual development time using Visual Basic would have been roughly the same, deployment would have been very difficult because an IS person has to set up each user's machine. We just wire Enlighten's application blocks [pre-built components] together and off we go." Symantec's users see a virtual cube of the data which they can slice, dice or drill down into dynamically. Brobst was delighted at how intuitive the results were. "After one day of training, we had developers using Enlighten to build applications. We were using a prototype application within two days and users learned it in an hour," he says.

The IT staff at Saratoga, Calif.-based Alain Pinel Realtors also wanted to deploy an application over the intranet. To do this, Mary McReynolds, director of MIS at the real estate firm, used Marimba Inc.'s Castanet, an application distribution and management system that works with C, C++, Java, Visual Basic and other languages to develop a browser-based application for real estate agents to show listings to clients. Marimba's "push" technology comes into play when Alain Pinel wishes to update a listing and make the new information available immediately, says McReynolds. "We liken this to a just-in-time application because the application that gets downloaded by the agent might have been revised only 30 minutes before," says McReynolds.

For example, McReynolds added a floor plan page to its reference application and made it available to all the agents the same day. She also added a capability to retrieve a standard report from the database every morning and, because it was embedded in a Web page, she could add it to the firm's home page for quick reference by agents. Not only does Java help Alain Pinel keep its agents informed of the latest property listings, it also has a much quicker development time. "We subcontracted for the development, and we looked at C versus Java-based programming. The cost of Java development was less than a third of what it would have been for a C application," McReynolds says. "The Java application took about six months to develop, while the original bid for the C application would have taken a year and a half."

Extranets Too

A few companies are also using Java to develop applications that customers can access, but they're using it for many of the same reasons—development speed and deployment ease—as those who use it only for deploying applications on the intranet. At San Jose, Calif.-based Cisco Systems Inc., an Oracle database and Java are playing central roles in a complete rewrite of the company's electronic-commerce system, which now uses Java-enabled browsers as the front end to the product information stored in the database, explains Dale Seavey, IS manager of architecture and technology at Cisco. "We will use server-side Java, objects and Corba as the front end and the Oracle database as a back end. We reached a point where, though the old application was meeting our business needs, we had to take into account ever-changing business needs in our industry. For example, the

In Search of...Whatever

OK, THIS REALLY DOESN'T COUNT as an enterprise product, but it looked too interesting not to mention. Have you ever wanted to find a text string in every single document on your computer and change it (like when your company changes its name from, say, Bank of America to NationsBank)? New Art Technologies has released **NA-Word**, a tool for doing just that. Running under Windows 95, it can scan files on a local or network drive, replace them, color the changes and save the document. Here's the neat part: Although it requires the installation of Microsoft Word, it works on all word processing formats, such as Corel Corp.'s WordPerfect, Microsoft Works or Microsoft Write, as well as on text formats such as HTML or ASCII. Did the light bulb go on? That means NA-Word also works with source code like Java, Cobol and C.

And NA-Word handles macros and modules within files, plus wild card matching. The price is $225 for one to four copies, and site licenses are available. For more information, contact New Art Technologies at 212 362-0559 or visit *www.newarttech.com.*

Managing Your Web Development

FOR WEB TEAMS THAT NEED to centrally manage and deploy diverse Internet, extranet and intranet applications, Eventus Software Inc. has developed **Control**, a database system that works like version control for the Web. Control's source control server centralizes component location and access, while enabling Web teams to collaborate by providing check-out/check-in functionality and visual stamping. After editing or creating components with their existing development tools, users check components into the database. They can integrate existing content or legacy applications into Control's database using its import wizard.

The servers maintain meta data about the components, including link information, interrelationships among components and usage patterns. The server visually displays the data on its hypermap, a guide to an application's structure and component relationships. Problems such as mismatched links, unreplicable links or broken links are detected and corrected dynamically.

Control is available in WebManager and Enterprise editions. The WebManager edition uses a Microsoft Access database as its repository. The Enterprise Edition relies on an Oracle relational database. Both editions support Netscape, Microsoft, Oracle and Apache servers running the Unix and Windows NT operating systems. Pricing begins at $4,995 for the WebManager edition, and at $9,995 for the Enterprise edition. For further information, call 415 477-3700 or visit *www.eventus.com.*

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old application accounted for 60 percent of our total revenue, and we're confident that the new one will be higher," says Seavey. "Maintenance was also a headache. It's much easier to find Java programmers now, and now there are a lot of Java development tools available."

For the new application, Seavey likes the idea of using Java-based Corba-standard objects on the Internet because Cisco's customers can access the e-commerce system from any platform using browsers. Java is more appealing than C++ because of Java's built-in networking smarts, he adds.

Based on logs of Web site hits, as well as customer statistics, Cisco can update the Java-based application. "We can make proactive changes based on trends we see from customers," explains Seavey. "Java makes this easy because we're using objects instead of Perl and CGI scripts." Perl and CGI are scripting languages, originally used to automate routine tasks on Unix machines, which initially were the most popular Internet development languages. Java improves on these pioneers in more ways than one: Seavey says that staff costs for Java maintenance are about two-thirds of those for CGI and Perl scripts.

A company's IT staff can also be sure that users get the latest version of a Java-based application because every time they access the application it is downloaded from the server to a browser. Application flexibility is essential due to drastically shortened lifetimes. "You used to look at a two-year life span for an application. Now with the Internet, an application can be outdated in six months. You have to be quick on your feet, and we are staying on our feet by using Java," notes Seavey.

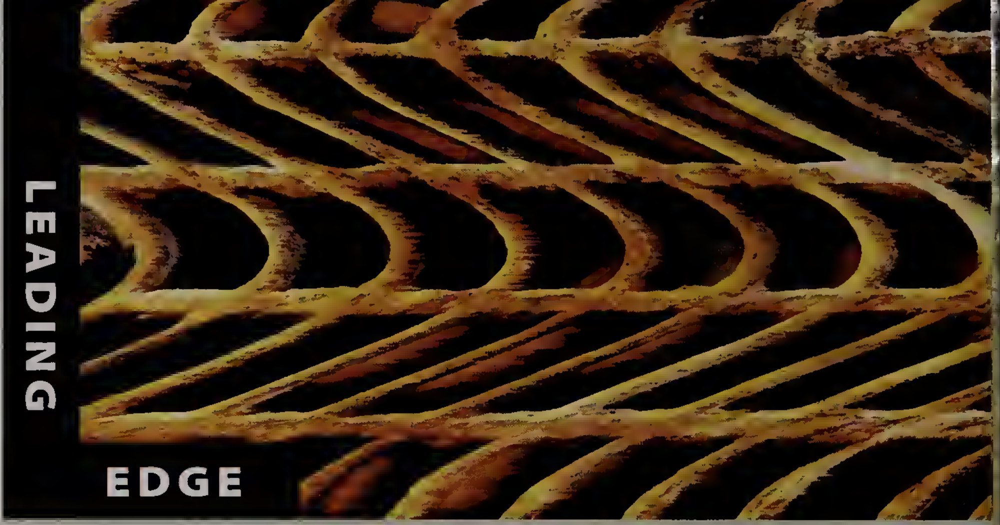
A Separate Piece

Users cite Java development tools' ability to quickly and easily model a company's business rules separately from the application itself as a big advantage. Vision Software's Jade, for example, lets users automate the translation of declarative business rules into complete Java applications, according to the company. In addition, Jade's application development strategy allows programmers to work closely with business managers, a concept that is crucial in producing mission-critical applications, says Dr. William Shek, director of diagnostic services at Charles River Laboratories, a Wilmington, Mass.-based subsidiary of the Bausch and Lomb Co.

But users also caution that Java is not the panacea to deploying applications. When considering Java for application development, IT managers should remember that version control and connectivity can be sticky issues.

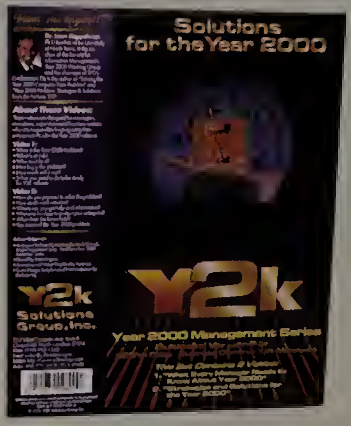
"Java makes sense for large, companywide applications like Philips' pricing application, but I'd probably shy away from putting this on a public-access site because there are too many version-dependent pieces. You'd need certain patches and browser versions to ensure that a Java application works well," says KPMG's Hendryx. "A corporation can control these things internally. Java is still less than mature and these problems will go away over time." CIO

John Webster is a freelance writer based in Natick, Mass. He can be reached at jwebs@tiac.net.



Cue the Video

TRYING TO GET SOMEONE in your organization to focus on Y2K without success? If they won't listen to you, maybe they'll listen to some experts. Y2K Solutions Group Inc. has developed a series of videotapes focusing on various aspects of the millennium bug. **The PC Network Series** ($149) includes three videotapes, one each on hardware, software and date data information (everything you wanted to know about windowing, conversion, bridging and more). The Management Series ($199) includes two videotapes targeting executives, managers and business owners concerned about Y2K; the first one defines the problem and the second outlines the solutions. The SPG Conference Series, taped at July's Y2K seminar, captures 16 of the conference presentations, including data issues ($99), desktop software ($249), safe harbor testing ($99), embedded systems ($249), vendor management ($99), insurance issues ($99), legal exposure ($99), risk management ($99) and AS/400 remediation ($249). For more information, call 919 933-1243 or visit *www.y2kvideos.com.*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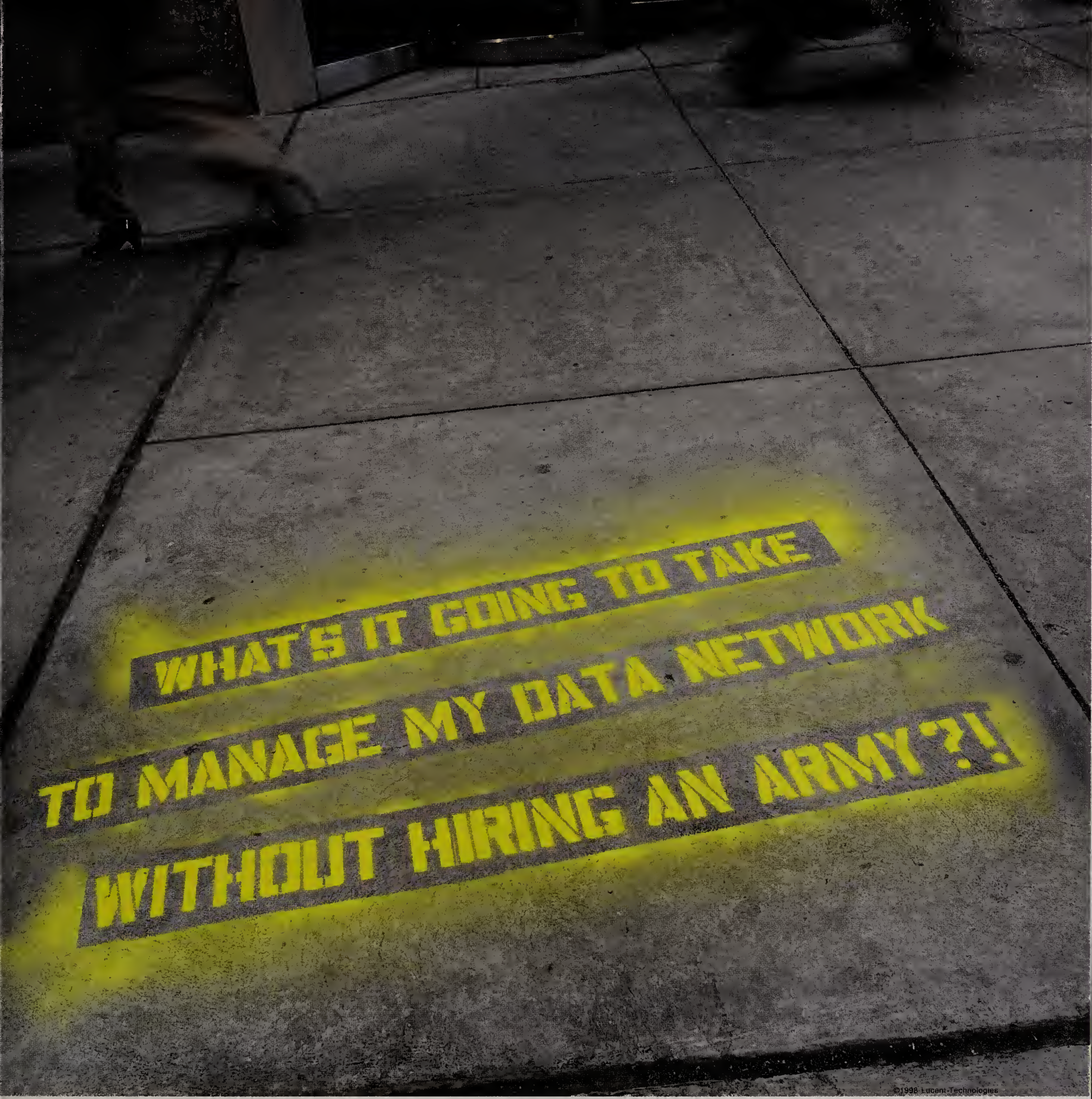

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HDR's Angelo Privetera on selling the value of IT

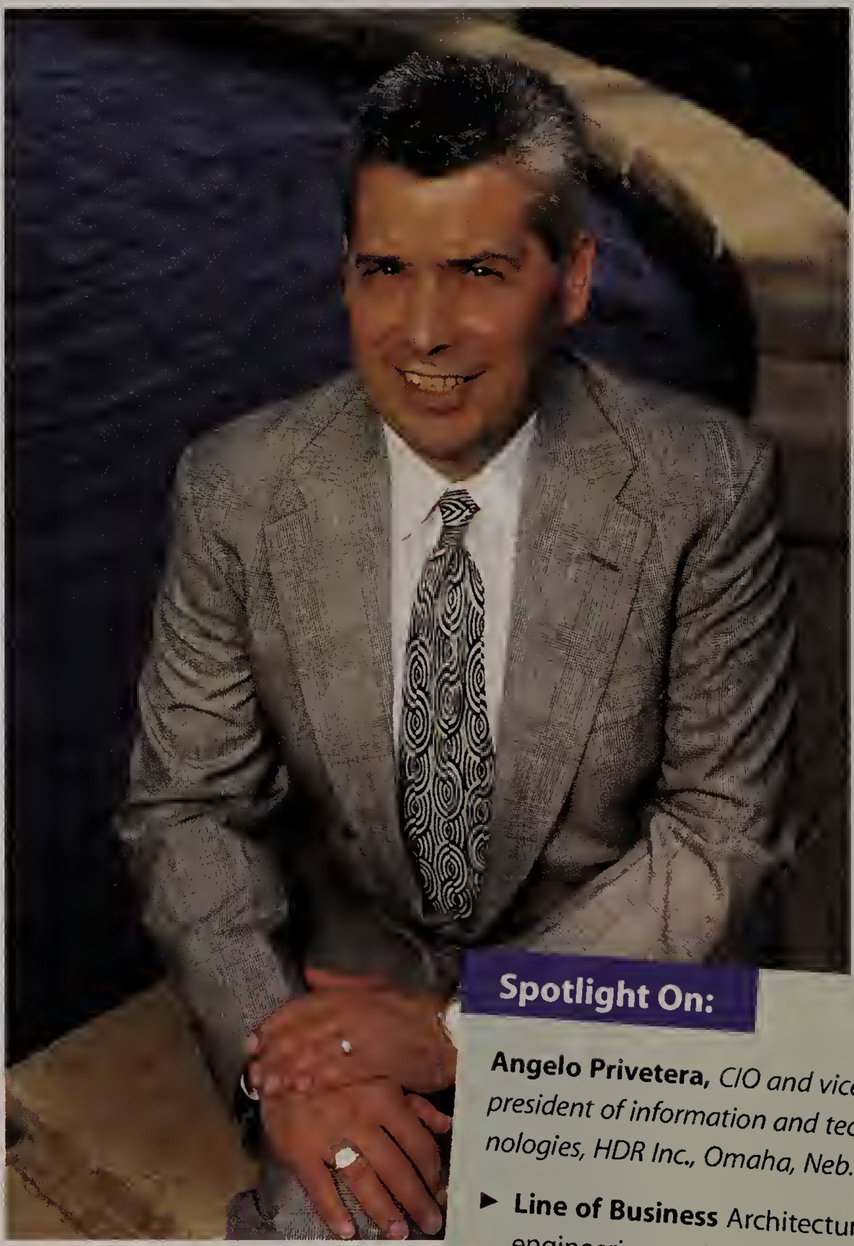


PHOTO BY JOHN HARQUAIL

Spotlight On:

Angelo Privetera, *CIO and vice president of information and technologies, HDR Inc., Omaha, Neb.*

- **Line of Business** Architecture, engineering and planning
- **Bio** Director of technology for Ball Corp. for 15 years before joining HDR four years ago
- **Day to Day** Serves as technology advisor to the company, manages operations of the IS organization and holds a seat on the senior management team
- **Challenges** Communicating the value of IT to the business so IT's strategic use can contribute to greater growth

CIO: How has IT changed HDR since your arrival?
We've grown a lot and we employ more technology. But our network is stronger than ever. When I got here, we had 300 or 400 computers. Now we've got at least a single desktop machine for every person in the company—about 2,000. And everybody is connected to the network. Yet, since we're not a huge company with money to burn, we must still carefully consider every investment.

How much time do you spend keeping up with the business challenges of the architecture and engineering industry?
I probably spend half my time on that. Not the specifics, like what exactly we are doing on this roadway design project. Instead, I concentrate on where we're trying to go with the business and how that applies to what I do for this organization.

Does your job include helping business-side executives see the value of IT?
What is IT really worth, anyway? Nobody seems to know. HDR has a heavy dependence on technology. Personally, I don't think we can do business without technology. And our executives know that they have all this technology at their disposal and believe it's a critical factor to their success. But I can't tell them what it's worth. It's not my place to do that; that's something they need to decide.

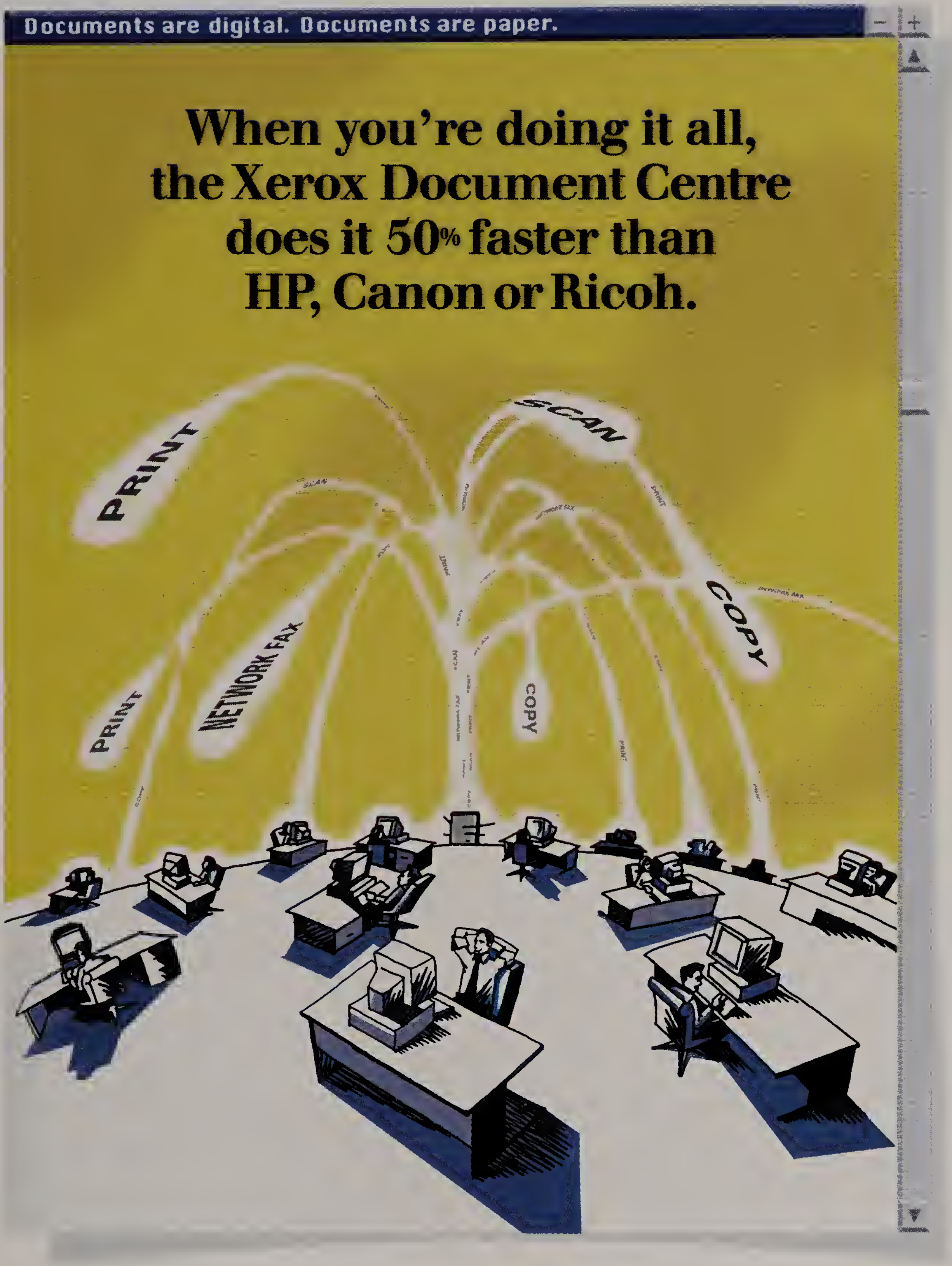
Well, isn't it your job to influence their decisions?
Sure. HDR's management is probably one of the best around when it comes to accepting on faith what I say we need to do. The problem is that senior management also has to make certain that they can explain and sell my recommendations to the other business players throughout the company, especially since we're employee-owned. Users don't always buy into the technology. But I think they need to realize that IT is the way they work; it is their business. They take the phones for granted, because they couldn't work without them. Well, IT needs to be taken for granted in the same way.

Because technology cycles move so quickly, it's difficult to get anyone to really buy into information technology at all. As a member of senior management, I can and do sell the case for our heavy investment in IT. But the point is, I shouldn't have to do any selling. We've been put in the position of having to sell people on things that are really necessary, things that are part of the business.

Do you see a time when you can take off the sales hat?
No, but I'm always looking for that silver bullet that will help me break through to those users. I think the architectural industry is more heavily immersed in technology than most, so technology's central place should be understood. It should be a component of the business that everyone has to master.

So it's not so much about needing to defend IT?
That's right. I just want to make sure the company reaches its potential with all the capabilities available to it. Instead of growing 30 percent a year, we could grow 60 percent.

–David Pearson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